Vol. XIV, No. 12 JULY, 1945

THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

Plastics—The Product and the Techniques of Manufacture—A Symposium

Introduction . . . . . by *Andrew E. Rylander*

1. The Product . . . . . by *Carl Sundberg*

2. Their Properties . . . . . by *Gunnar Skog*

3. The Tools . . . . . by *Anders Jansson*

4. The Machines . . . . . by *Rex Heath*

5. The Flow of Materials . . . . . by *Dr. E. J. Storfer*

6. Plant Layout . . . . . by *B. M. Hoover*

Machine Parts and Bearings Fabricated from Powdered Metals . . . . . by *George E. Platzer*

Speed and Precision With Hyper Drilling . . . . . by *Karl Stad*

Research and Quality Control of Materials . . . . . by *E. H. Gurney*

Departments

Good Reading

Gadgets

A.S.T.E. News

Departments

Fundamentals of Tool Engineering

Tools of Today

Machine Tools and Tool Engineering are the Keystone to Mass Production of War Materiel

"This stuff's pretty fussy . . . give it to a shop with Pratt & Whitney Equipment"

It stands to reason that, all other things being equal, *the better equipped a tool shop is, the better it can satisfy you on quality and accuracy.*

The manufacturer who buys tools, dies, jigs, fixtures, and other precision equipment from a shop using Pratt & Whitney machine tools, small tools, and gages can expect just that much more quality and precision in anything they make for him.

And the chances are that Pratt & Whitney equipment will not only do the job better, but do it *faster.*

This is a tip worth heeding . . . whether you need new tools now, or for reconversion later on. For 85 years wise manufacturers have proved to their own satisfaction that the name Pratt & Whitney stands for accuracy and dependability second to none.

Typical of the many P&W machine tools found in any well-equipped shop is this Jig Borer — one of the finest precision machines ever built. Designed specifically for the particular job of precision boring, this machine also can be used as a "jig eliminator" on small lot precision manufacturing. Write for full information on this and other Pratt & Whitney toolroom equipment.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

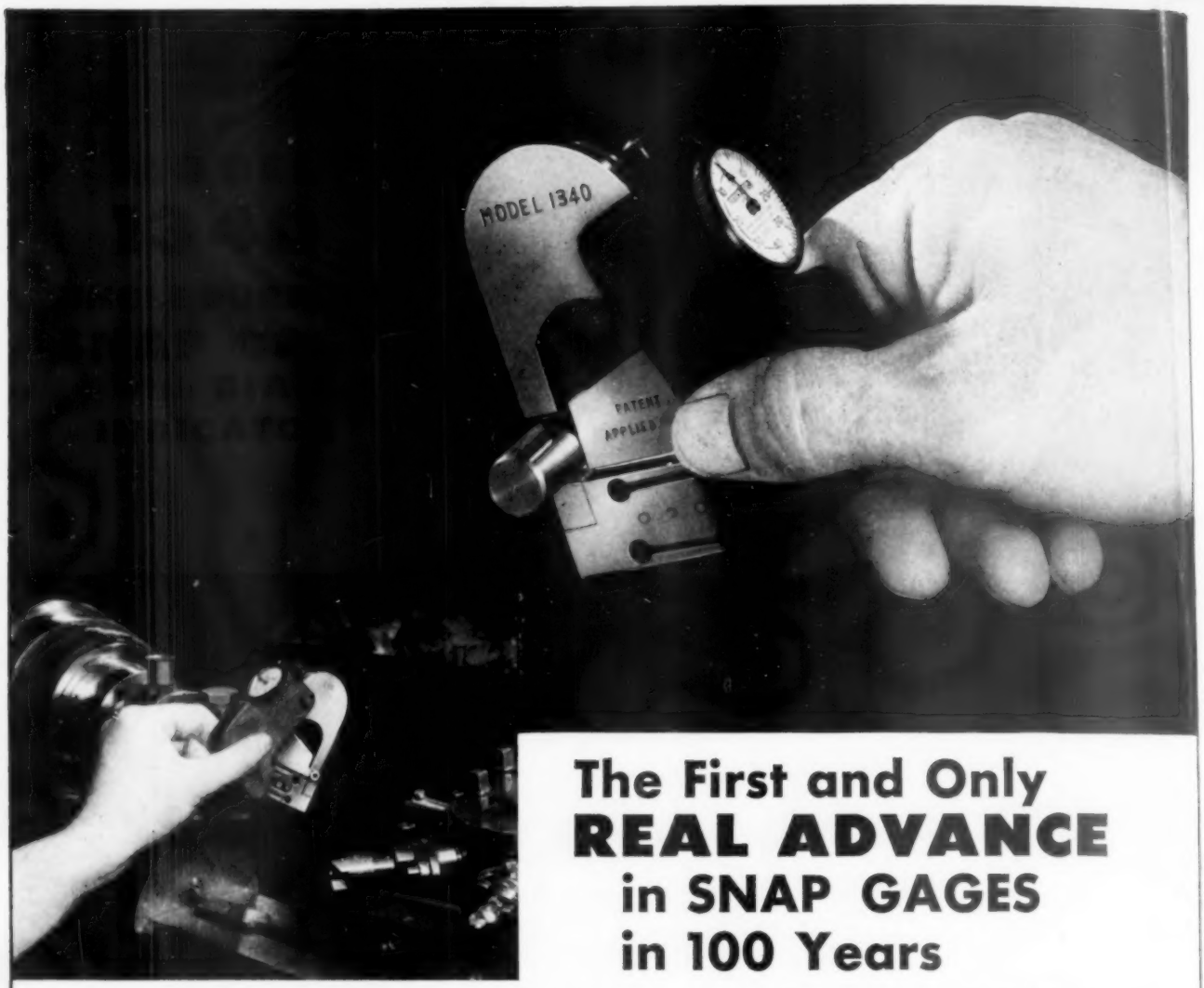
WEST HARTFORD 1 • CONNECTICUT

Get Extreme Accuracy, High Spindle Speeds and Ease of Operation with this HARDINGE Second Operation Machine

CAPACITY:
1/16" to 1" with collets
1" to 6" with step chucks
1" to 5" with jaw chucks
Spindle Speeds:
100 to 4000 r.p.m.

The combination of extreme accuracy, high spindle speeds and ease of operation means better results under the close tolerances of manufacturing standards both today and in the days to come. The ease and simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



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Since Eli Whitney first used Snap Gages to make interchangeable parts in quantities, Snap Gages have barely changed. . . . But this Federal Snap Gage is a "natural". All the advantages — speed, accuracy and positiveness of the Dial Indicator, are applied simply and directly to a simple, light and compact, single purpose snap unit. It is ideal for Statistical Dimensional Control.

Graduated, .0001"
Capacity, any single dimension between 1/8" and 1 1/2"
Range, .008"

No More Gaging by Main Strength
You READ the DIRECT Dimension Directly

Nobody ever magnified the sense of touch. Solid, fixed snap gages can't talk and tell you how tight they feel on the work, but Dial Indicators do magnify so you can SEE the actual dimension. This Snap Gage shows you *how much* the dimension varies. A "must" requirement when using Statistical Dimensional Control Methods. Write us for further details.

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TABLE OF CONTENTS

PAGE

TOMORROW: AN A.S.T.E. STANDARD . . . . *by C. V. Briner* 17

PLASTICS—THE PRODUCT AND THE TECHNIQUES OF MANUFACTURE—A SYMPOSIUM 18
INTRODUCTION . . . . . *by Andrew E. Rylander*
1. THE PRODUCT . . . . . *by Carl Sundberg*
2. THEIR PROPERTIES . . . . . *by Gunnar Skog*
3. THE TOOLS . . . . . *by Anders Jansson*
4. THE MACHINES . . . . . *by Rex Heath*
5. THE FLOW OF MATERIALS . . . . . *by Dr. E. J. Storfer*
6. PLANT LAYOUT . . . . . *by B. M. Hoover*

SPEED AND PRECISION WITH HYPER DRILLING . *by Karl Stad* 33

MACHINE PARTS AND BEARINGS FABRICATED FROM POWDERED METALS . . . . . *by George E. Platzer* 36

RESEARCH AND QUALITY CONTROL OF MATERIALS . . . . . *by E. H. Gurney* 42

SPIRAL GRINDING OF TOOLS . . . . . *by Franklin J. Blaney* 47

THE DRAFTING OFFICE AND THE WORKS 82

THE HINGED MOTOR—IT ALWAYS DOES THE "RIGHT" THING . . . . . *by W. T. Schaphorst* 84

DEPARTMENTS

FUNDAMENTALS OF TOOL ENGINEERING
THE ELEMENTS OF WIRE DRAWING 40
A.S.T.E. NEWS 65
TOOLS OF TODAY 93
ANDYGRAMS 104
GADGETS 110
GOOD READING 117
BULLETINS AND TRADE LITERATURE 118
INDEX TO ADVERTISERS 126

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Easy to use ... and so many places to use them

BETHLEHEM CARBON TOOL STEELS

Your tailor does not try to make one suit of clothes fit hundreds of different men. But in the case of carbon tool steel, the metallurgist is faced with the task of developing a single product for hundreds of different purposes—so that *your* job of selecting steel will be simplified.

Bethlehem carbon tool steels, with their tremendous range of applications, are the wheelhorses of the tool room. Here are a few of the characteristics that make these steels suitable for so many different tasks:

- ★ High, uniform hardness
- ★ Uniform grain structure
- ★ High abrasion-resistance
- ★ Excellent machineability
- ★ Simplicity of heat-treatment

Because of the high carbon content, special melting technique, and restrictions on incidental elements, Bethlehem carbon tool steels are produced under unusually rigid controls. They are not easy steels to make. But they *are* easy steels to use, as thousands of customers can testify.

When you purchase Bethlehem carbon tool steel in the X, XCL, or XX grade, you are buying a product that is generally regarded as the standard of the industry for hundreds of applications. To make sure that you are not overlooking some of its many uses, check with your nearest Bethlehem distributor.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
Bethlehem Steel Export Corporation, New York City

BETHLEHEM STEEL

X, XCL, XX ... *members of Bethlehem's BIG 8 Tool Steels*

New!

STANDARD

COMPARATOR

DIAL SNAP GAGE

PATENT APPLIED FOR

Lighter weight... Easy to handle

ACCURATE TO .00002"

Comparator accuracy is brought right to the machine — in an instrument as light in weight as the ordinary snap gage. Easy to handle and easy to operate. No special skill needed. It can improve your inspection as well as your production.

6 Important Superiorities

Spherically surfaced upper anvil with flat lower anvil facilitates setting without danger of out-of-parrallelism. Also available with flat-shaped anvils for checking close to shoulders.

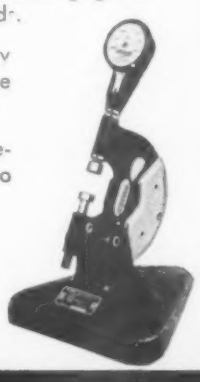
Upper anvil of wear-resistant cemented carbide; lower anvil (flat-lapped serrated surface) tipped with cemented carbide. Chips and dirt readily clear from this surface.

STANDARD Shockproof dial indicators furnished with these gages are an important factor in their *superior* accuracy.

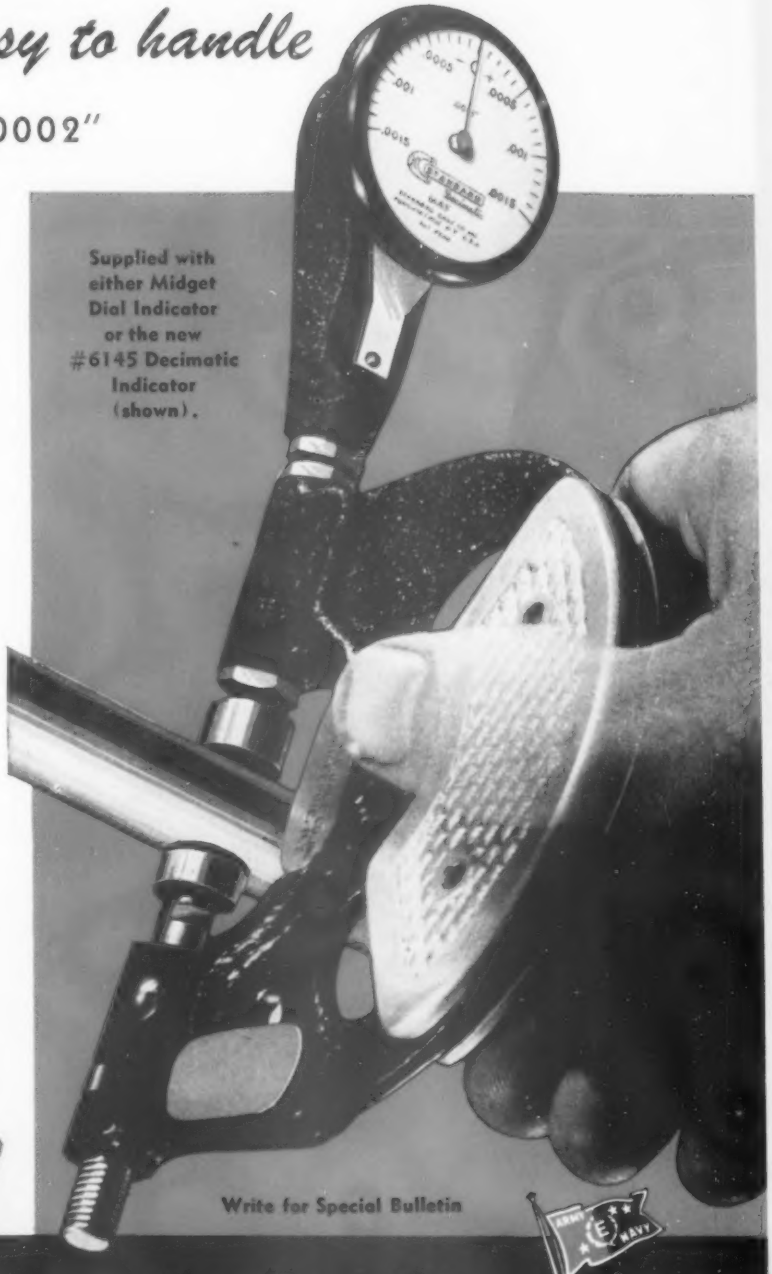
Thermal grip insulated from gage body by air space. Heat of operator's hand has little effect on gage setting, even when used over long periods.

Dial indicator may be faced in any direction to permit reading from the most convenient angle.

Indicator graduated in .0001". Dependable readings can be made to .00002".



Eight sizes, each with a range of 1", cover range of 0" to 8". First three sizes can be used in bench stand for bench inspections. Sizes above 8" to order.



Supplied with either Midget Dial Indicator or the new #6145 Decimatic Indicator (shown).

Write for Special Bulletin

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

AN EXAMPLE
of **NATCO'S**
CONTRIBUTION TO THE

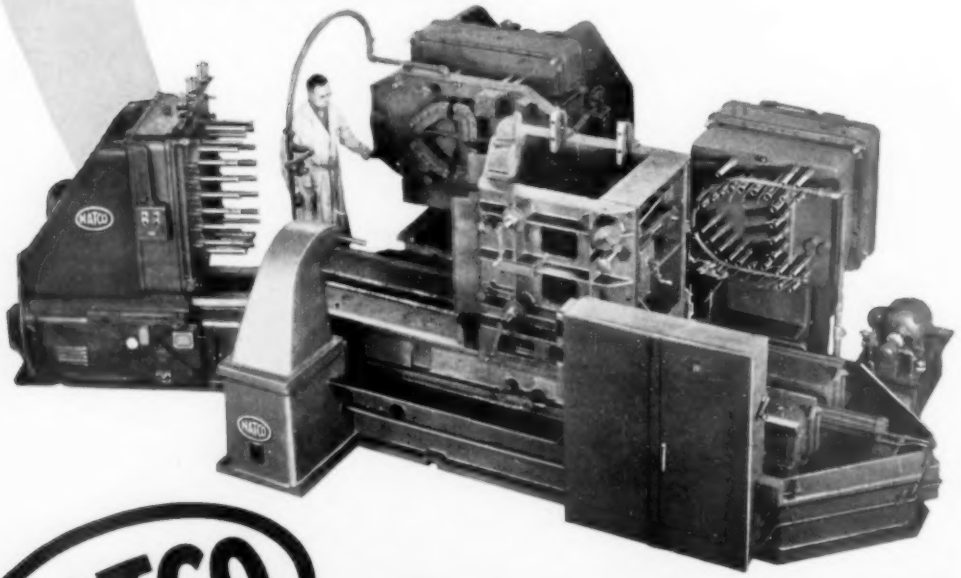
MIRACLE

1504 3/8" TO 3/4" HOLES MULTI-DRILLED AND TAPPED PER HOUR, IN HEAVY DIFFERENTIAL CARRIERS . . . MATERIAL: CAST STEEL

"NATCO HOLEWAY for the Hole Job"

NATCO HOLEWAY Machines, such as illustrated on these pages, are engineered for specific jobs . . . jobs which are now talked of throughout the world as Miracles of Production, and rightfully so.

NATCO has contributed generously to this miracle, supplying multiple drilling, boring, and tapping machines, many of which were for parts previously considered too large or too heavy for multiple equipment. Production requirements demanded multiple machines; so NATCO built them from standard HOLESTEEL Units, HOLE-TAPPER Units, or HOLEUNITS.



NATCO **HOLEWAY**

OF PRODUCTION

NATCO HOLEWAY for Heavy Parts

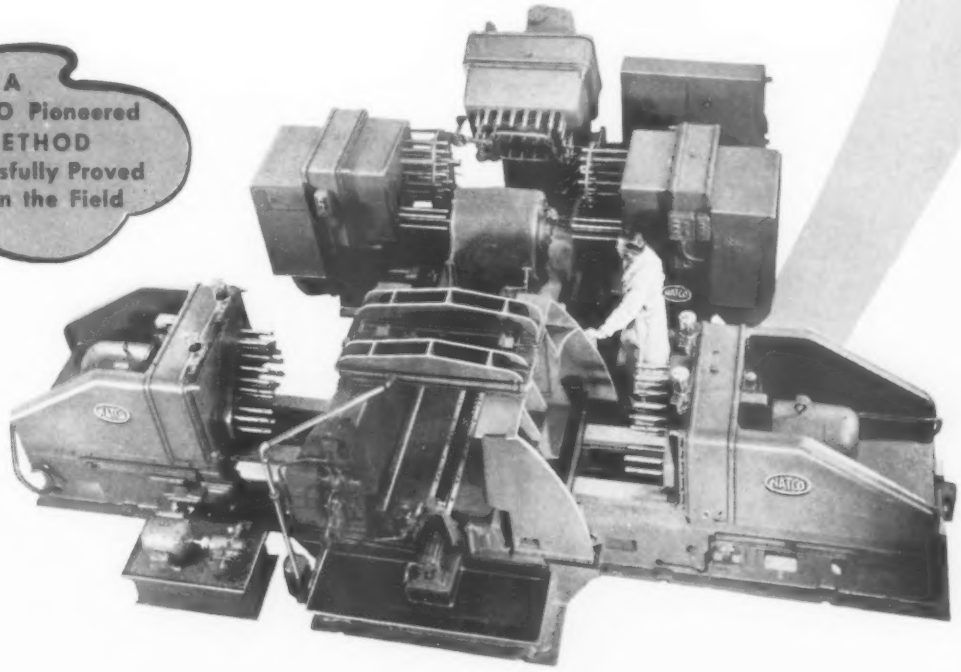
The machines shown on these pages were engineered for a prominent manufacturer. A total of 94 drilling and 94 tapping operations was required on four different faces of a 650-lb. cast-steel Differential Carrier. Eight parts are produced per hour, accounting for 1504 separate operations.

The HOLEWAY on the opposite page consists of two HOLESTEEL Floor-Type Drilling Units and one HOLETAPPER Unit. Fifty-four holes are drilled and 28 tapped in two faces.

The HOLEWAY shown below consists of two HOLESTEEL Floor-Type Drilling Units and three HOLETAPPER Units. Forty holes are drilled and 66 tapped in three faces.

NATCO HOLEWAY, regardless of the size of the part, may be the answer to your drilling and tapping problems, too. Send us your blueprints or call a NATCO Field Engineer and have your requirements analyzed.

A NATCO Pioneered METHOD Successfully Proved in the Field



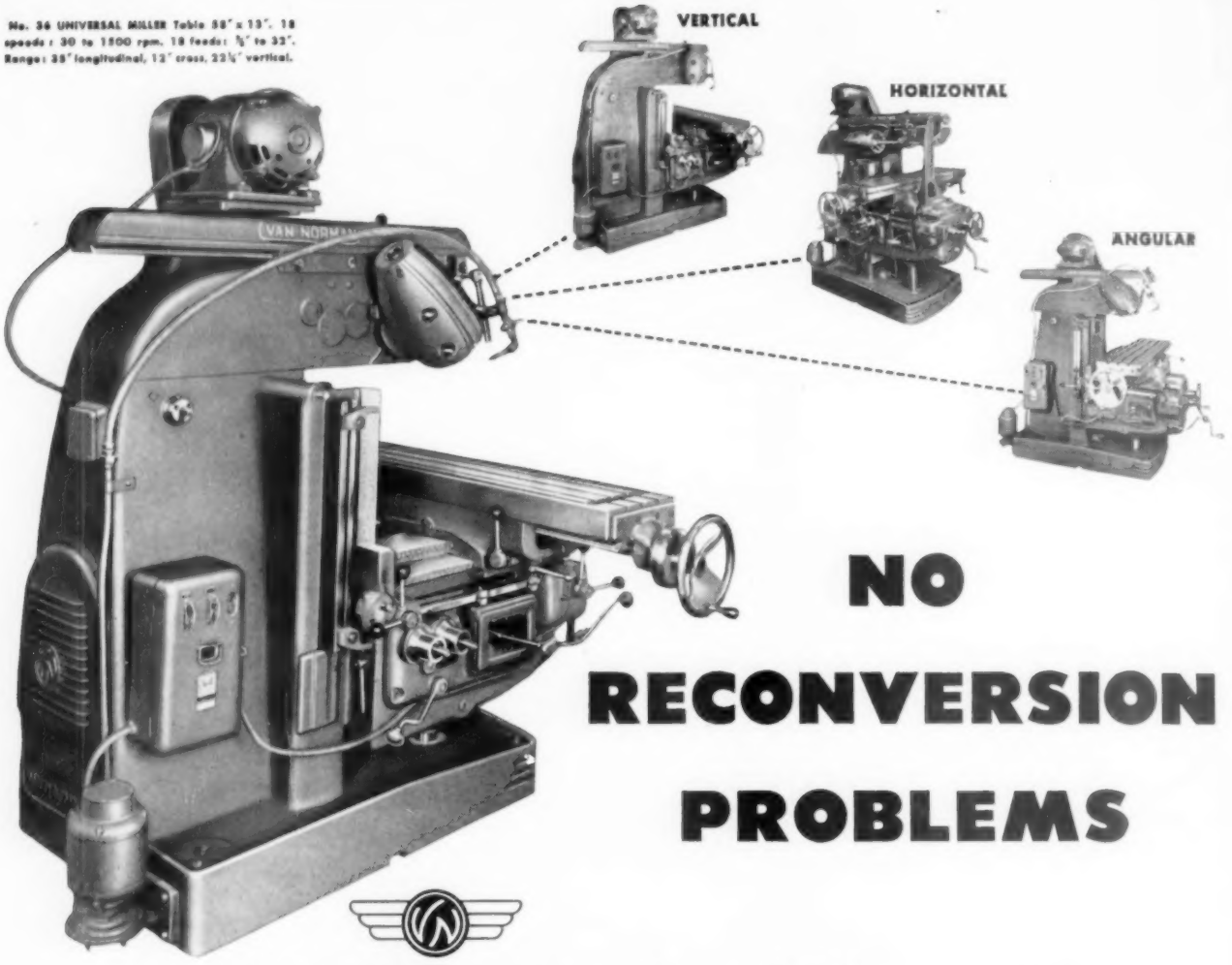
National Automatic Tool Company, Inc., Richmond, Ind.

MULTIPLE DRILLING, BORING, AND TAPPING MACHINES

INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1809 ENGINEERING BUILDING, CHICAGO; 409 NEW CENTER BUILDING, DETROIT; 1807 ELMWOOD AVENUE, BUFFALO; 2902 COMMERCE BUILDING, NEW YORK CITY

No. 36 UNIVERSAL MILLER Table 58" x 15". 18 speeds: 30 to 1500 rpm. 18 feeds: ⅛" to 33". Range: 35" longitudinal, 12" cross, 22½" vertical.



NO RECONVERSION PROBLEMS

...with VAN NORMAN Ram-Type Millers on the job

Here's a milling machine that not only meets today's war requirements but will also be ready to use when you *reconvert*, tomorrow . . . because the adjustable cutterhead makes it adaptable to many jobs. This means that no matter what your milling jobs are . . . horizontal, vertical or angular . . . they can be produced on Van Norman Ram-Type Millers. The result is no idle machine time, a daily profit from continuous machine operation and greater miller production capacity. And that's not all . . . the versatility of the swiveling cutterhead permits many jobs to be carried through to completion without changing the original work set-up with subsequent reduction of rejects through more accurate work.

In addition, Van Norman Ram-Type Millers provide such additional advantages as front and rear control of all power and manual feeds which give operators complete control of the operation whether they are at the front or rear position. The moveable ram, in combination with the saddle movement, increases the working capacity of the machine. The sturdy heavy-duty column, knee and saddle assure rigidity for extreme accuracy. The single lever feed selector permits quick, easy selection of the proper feed required for the cutting operation. Other advantages such as large easy-to-read dials, conveniently located speed selector, rugged over-arm, 6-way rapid traverse and new heavier ram all assure accuracy, ease of operation and cost-cutting production.

Investigate Van Norman Ram-Type Millers today. See for yourself how these machines will do your work today *better* . . . and solve your milling machine reconversion problems as well.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

TAPPING TROUBLE? TYPICAL CASE SHOWS HOW ALERT "GREENFIELD MAN'S" QUICK SERVICE SOLVES PROBLEM

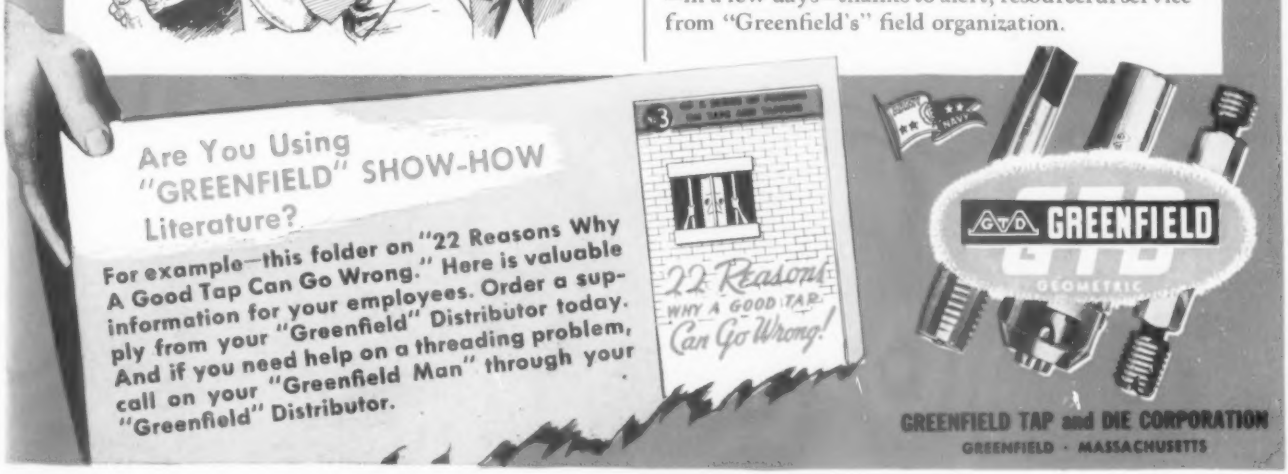
[A GTD SHOW-HOW REPORT]

1 A small southern plant, wrestling with new war order calling for close threading tolerances, was having trouble getting Class 3 fits. In re-ordering taps from "Greenfield," they mention problem in foot-note on the order, wondering if job calls for a "special" tap.

2 The "Greenfield" home office writes immediately for complete data needed to help customer with problem. Copy of correspondence automatically goes to "Greenfield Man" in customer's territory. "Greenfield Man," familiar with customer's tapping operation, suspects something other than the tap is causing the trouble. He visits plant immediately.

3 Customer shows him the tapping operation which is causing the trouble. "Greenfield Man," checking various factors which might affect accuracy, discovers tap and work are out of alignment, and suggests how to correct trouble.

4 Result . . . customer is able to get Class 3 fits with no difficulty and without the "special" taps he thought might be needed. His problem is solved—in a few days—thanks to alert, resourceful service from "Greenfield's" field organization.


Are You Using "GREENFIELD" SHOW-HOW Literature?
For example—this folder on "22 Reasons Why A Good Tap Can Go Wrong." Here is valuable information for your employees. Order a supply from your "Greenfield" Distributor today. And if you need help on a threading problem, call on your "Greenfield Man" through your "Greenfield" Distributor.
22 Reasons WHY A GOOD TAP Can Go Wrong!
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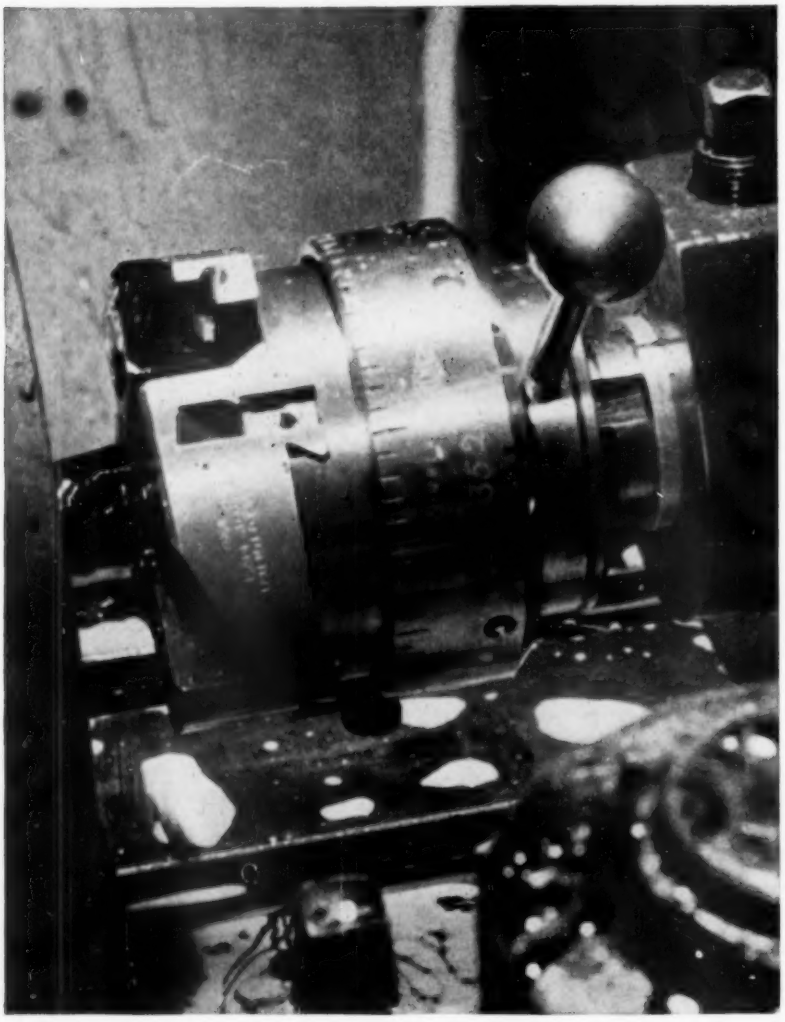
GTD
GEOMETRIC
GREENFIELD TAP and DIE CORPORATION
GREENFIELD · MASSACHUSETTS

For Finer THREAD ACCURACY in AIRCRAFT



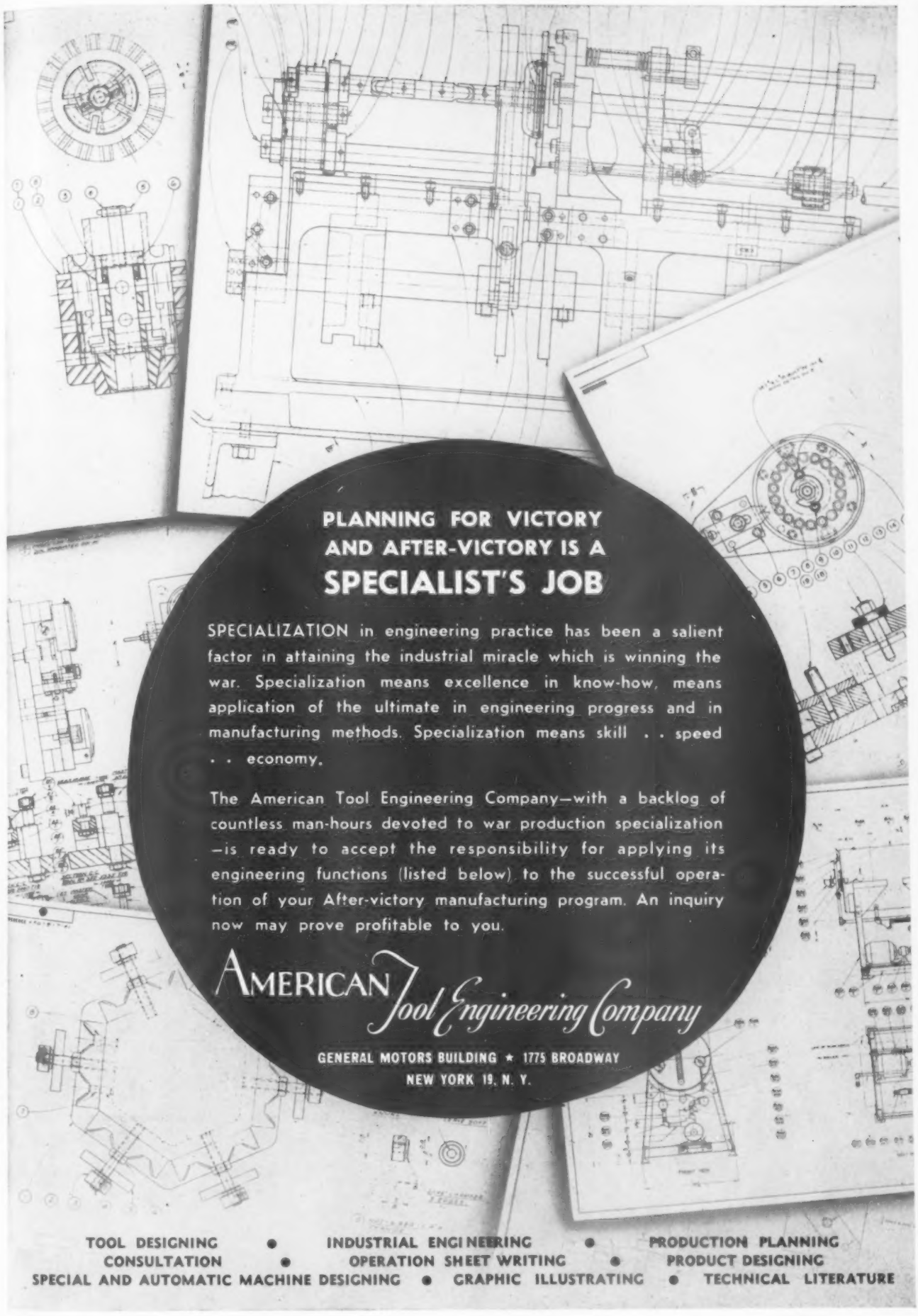
LANDMATIC HARDENED AND GROUND HEADS

Whether it be retractable landing gear assemblies, bomb bay doors, engine parts, fuel lines—or hundreds of other vital components where threads are the prime fastening or functional means—LANDMATIC Heads are producing threads for these parts to the close tolerance specifications that assure dependable operation.

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

Write for Bulletin No. F-80

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS


PLANNING FOR VICTORY
AND AFTER-VICTORY IS A
SPECIALIST'S JOB
SPECIALIZATION in engineering practice has been a salient factor in attaining the industrial miracle which is winning the war. Specialization means excellence in know-how, means application of the ultimate in engineering progress and in manufacturing methods. Specialization means skill . . speed . . economy.
The American Tool Engineering Company—with a backlog of countless man-hours devoted to war production specialization—is ready to accept the responsibility for applying its engineering functions (listed below) to the successful operation of your After-victory manufacturing program. An inquiry now may prove profitable to you.
AMERICAN Tool Engineering Company
GENERAL MOTORS BUILDING ★ 1775 BROADWAY
NEW YORK 19, N. Y.
TOOL DESIGNING • INDUSTRIAL ENGINEERING • PRODUCTION PLANNING
CONSULTATION • OPERATION SHEET WRITING • PRODUCT DESIGNING
SPECIAL AND AUTOMATIC MACHINE DESIGNING • GRAPHIC ILLUSTRATING • TECHNICAL LITERATURE

Here's Help FOR YOUR TOOL ROOM

The New COVEL
CUTTER & TOOL GRINDING MANUAL

A time-and-money saving factual aid for new hands in the toolroom—and for seasoned veterans, too! A 128-page book that takes you through every step in setting up all types of milling cutters for grinding; that explains in graphic detail the use of various accessories on cutter and tool grinders;—covers thoroughly the operation and use of a cutter and tool grinder;—gives practical help in choosing the right grinding wheel for every job . . . Plus page after page of grinding tips and short cuts that will mean added savings in time and manpower for you. And there's a whole section of tables and charts, arranged for handy reference, to cut down pencil and guess work. Write your name and position on your company letterhead, and send it to us for a free copy of this new Covel Manual, "Universal Cutter and Tool Grinding"—A regular $1.00 value—but it's *free* to you toolroom and production men. Write for "Handbook 1 75" today.

This is just another example of Covel Service to industry. Since 1874, manufacturers have been bringing their grinding problems to Covel, with complete satisfaction. This company now offers a complete line of Cutter and Tool Grinders, Drill Grinders and small Surface Grinders. Let Covel experience show you what can be done to improve production and cut costs in your toolroom.

Covel No. 12 Cutter and Tool Grinder

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

NORTON *has Complete Service for* GRINDING CARBIDE TOOLS

Three Types of Diamond Grinding Wheels plus Crystolon Vitrified Wheels

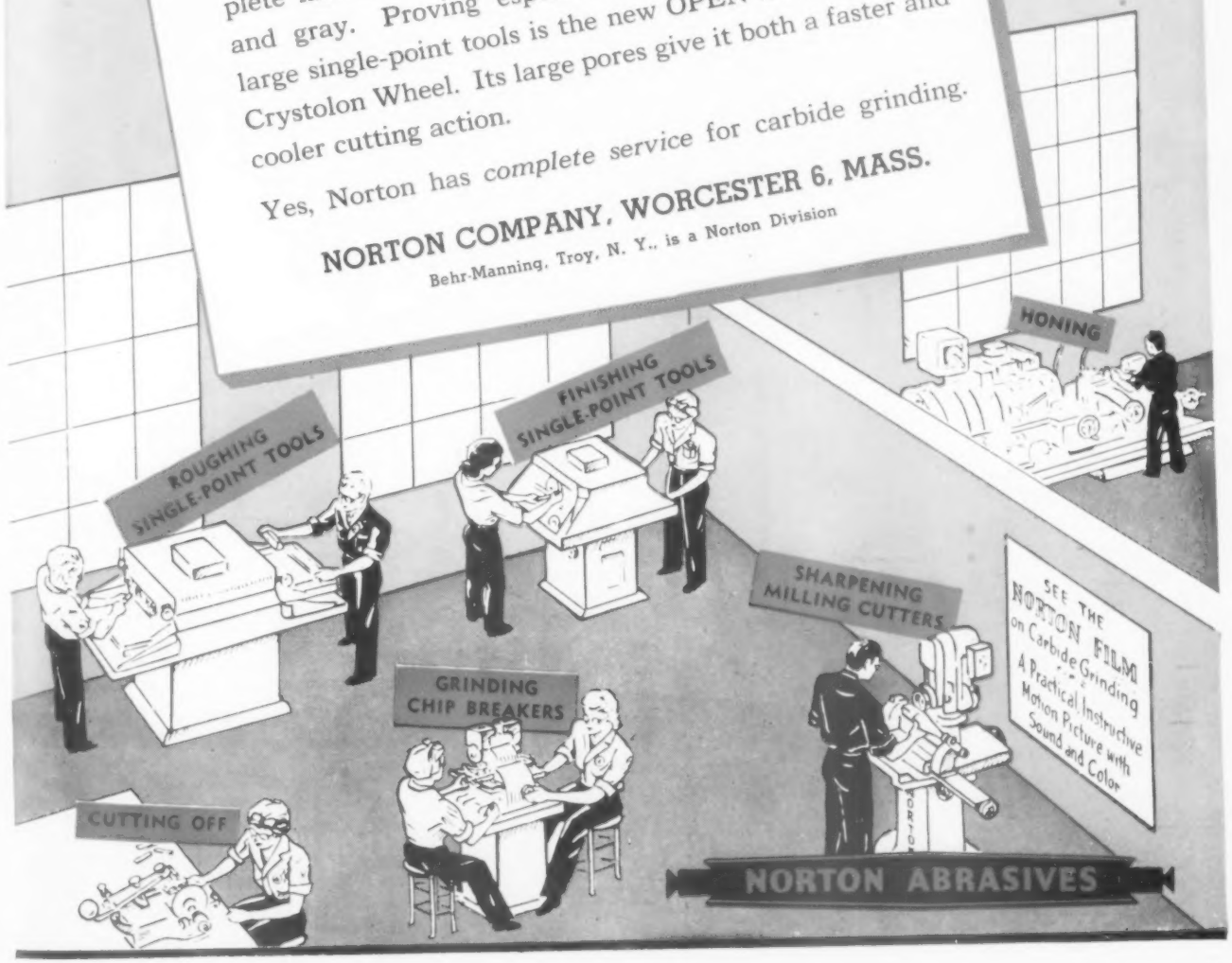
WHEN the Norton abrasive engineer makes a survey of your carbide tool grinding room he can supply just the wheel you need for every grinder. He has *three types* of diamond wheels to select from—the Norton Resinoid Bonded, the Metal Bonded and sensational new Norton Vitrified Bonded. Each type has its rightful place—is best for certain grinding jobs.

For the rough grinding of carbide tools he has a complete line of wheels of Crystolon abrasive—both green and gray. Proving especially popular for sharpening large single-point tools is the new OPEN STRUCTURE Crystolon Wheel. Its large pores give it both a faster and cooler cutting action.

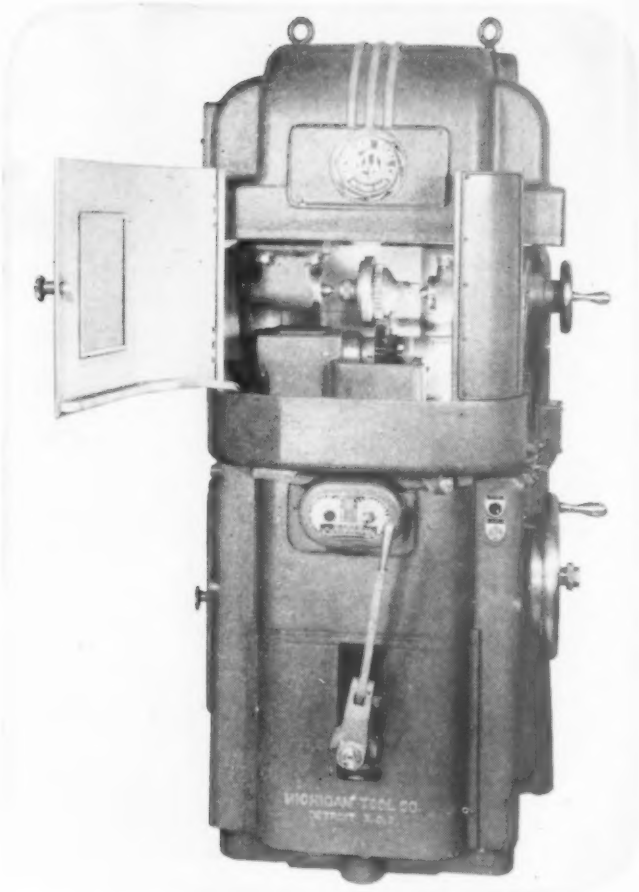
Yes, Norton has *complete* service for carbide grinding.

NORTON COMPANY, WORCESTER 6, MASS.

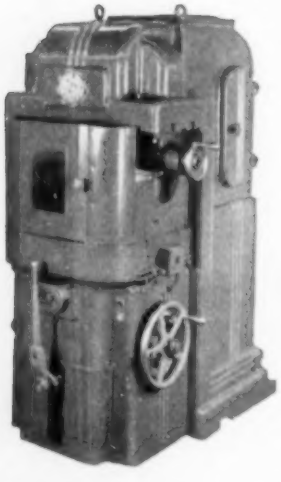
Behr-Manning, Troy, N. Y., is a Norton Division



FINISHING TIME: *24 seconds*



With UNDERPASS Shaving



Even close shoulder gears like this one represent no finishing problem when Michigan underpass shaving is used.

The gear being shaved is a 27 tooth, 22½° P. A., 7 NP. The same manufacturer finishes similar close shoulder 18 tooth and 33 tooth gears in 18 seconds and 24 seconds respectively. Allowing a loading time of even 15 seconds, production capacity is around 2 gears a minute.

In underpass shaving, finishing is at exact center distance, feed of the cutter being tangential. Usually a single reciprocation, from front to back and return, or vice versa, is sufficient to finish the gear.

For Machine details ask for Bulletin 860-A-44

BUY U.S. BONDS STAMPS

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

ORIGINATORS of GEAR-SHAVING

SPEED·ACCURACY·ECONOMY

These triple aims of all production and tool engineers can be achieved by Engineering Baker Brothers production machines to fit *your* needs. Typical of Baker Brothers' solutions of tough production problems is this Model 26 HO drilling machine with 4-spindle multiple heads and special fixtures.

Problem was to drill 8 taper holes at an angle on a circle in alloy steel rocket shell nozzle plates of 5 inch diameter and 1¼ inch thickness. Multiple drilling of all 8 holes in one piece would have involved mounting the drills at 8 different angles.

Solution was to drill one hole at a time in 4 pieces with vertical drills and with chucks mounted at the required angle.

Basically a standard machine adapted to a war-time job by the use of special fixtures and attachments, *this unit can readily be converted to peace-time production when the time comes.*

Have YOU a Tough Production Problem?

Drilling . . . Boring . . . Reaming . . . Tapping . . . Key-Sweating?

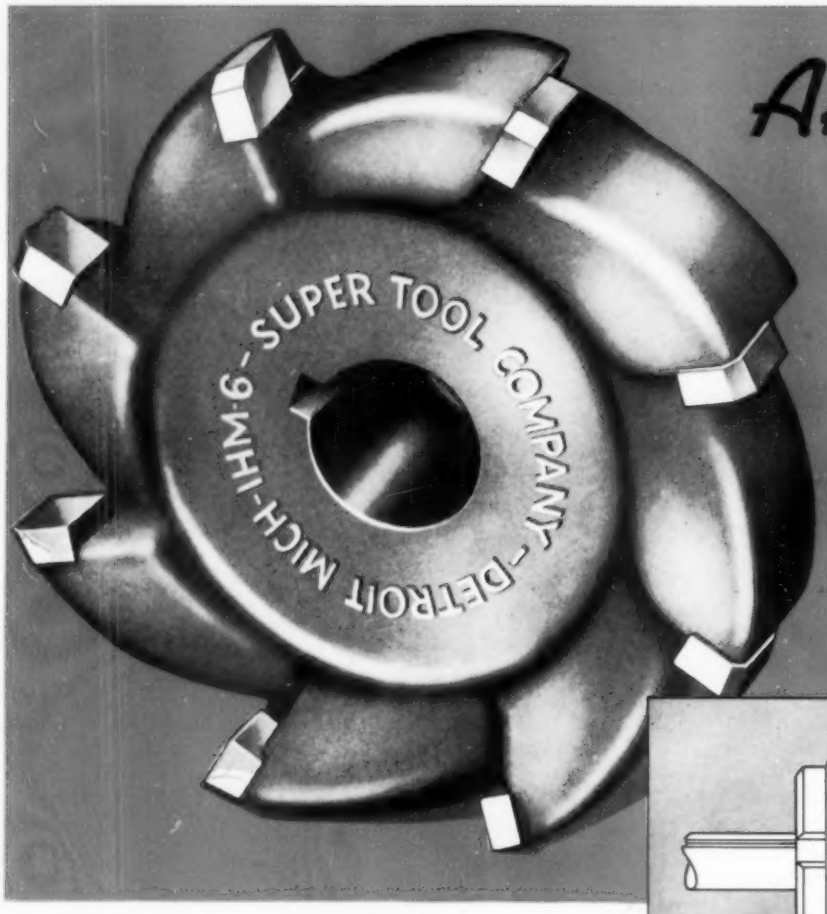
Just phone, wire or write Baker Brothers Engineering Service for help in working out the best solution. No obligation.

Operation is completely automatic. From the time the operator loads the 4 chucks and presses the starting button, the machine drills the first hole in the 4 pieces, withdraws the drills, indexes the chucks for the next holes, and repeats until all 8 holes have been drilled in the 4 pieces.

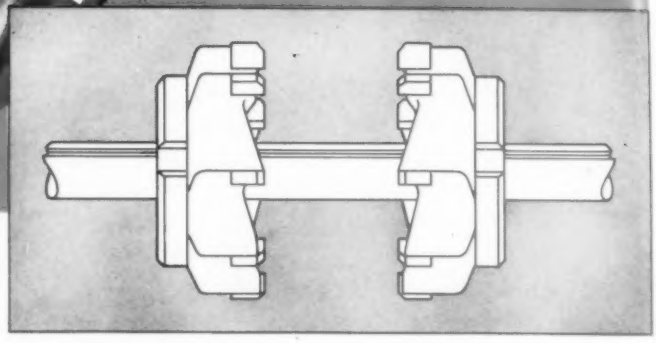
Drills used are specially ground taper twist drills, designed for maximum speed on this operation.

Simplified direct drive from main motor mounted on saddle, complete enclosure of working parts, and adequate lubrication, assure long life with low maintenance costs and minimum power loss.

BAKER *Bros. Inc.* ARMY E NAVY **Toledo 10, Ohio**



Announcing - the New SUPER HALF SIDE MILL!



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Tomorrow: An A.S.T.E. Standard

SINCE almost the earliest days of our Society, the A.S.T.E. has engaged in some form of standards activity. Its Standards Division has been responsible for the publication and distribution of scores of Data Sheets on various types of machines, tools, accessories, and so on.

The objective—then, as now—was: ***To Make Available to Tool Engineers, Members of A.S.T.E., and Production Executives in General, Standard Data on Machines, Tools and Processes of Practical Value.***

Considering the limited membership and facilities of the A.S.T.E. in the early days, a truly remarkable job was done. Today, however, our Society is among the largest of technical organizations in the world. It owes to its Members and to Industry a greater responsibility in the field of Standards.

At the May three-day meeting of the Executive and National Committees, that responsibility was recognized and thoroughly discussed. Out of that discussion there has been evolved an expansion of Standards activities far beyond the scope of anything ever attempted before in the Tool Engineering field. Far from abandoning previous activities, these are being intensified and made of greater usefulness.

These are not idle plans. They are not dreams. This is not something to start to work on "tomorrow." The A.S.T.E. is in it right now, and is in it with both feet and with shirt-sleeves rolled up. Its ***New Standards Committee*** already comprises men possessing not only the "Know-How," not only the desire to make "An A.S.T.E. Standard" mean something, but also the prestige in National Standards work which the activity deserves. Chairman of this Committee is William H. Smila, Master Mechanic of Chrysler Corporation (Plymouth Division) with Harold T. Johnson, Director of Standards Section, General Motors Corporation, as Assistant Chairman, together with D. D. Burnside of Aviation Corporation, working under supervision of W. B. Peirce, 2nd Vice President. Further, to the Central Staff of the Committee are being added, as rapidly as desirable, a representative of the Machine Tool Industry, a member of the Electrical Industry, a representative from Canada, etc. Secretary of this hard-hitting Committee, which meets at least once a month, is Frank Wilson, formerly with McGraw-Hill Publishing Company, now with our Central Staff as Editor of the forthcoming A.S.T.E. Handbook.

Activities of the Chapter Standards Committees are being welded into National Standards activities to avoid duplication of efforts and achieve the kind of two-way cooperation essential to maximum achievement.

Last month I ventured the prediction that the A.S.T.E. is going places. If that kind of a Committee, with the help of Chapter Committees cannot evolve the kind of Standards which Industry and the A.S.T.E. needs, it cannot be done. We believe it can.

Yes, the A.S.T.E. is coming into its own.

C. V. BRINER,
President 1945–46.

A Symposium—

Plastics--The Product and The Techniques

Materials and their properties integrated with the tools, machines and methods used in their processing.

IN PRESENTING this Symposium on Plastics to our readers, we have had several objectives in view. One, to provide a tangible grasp of fundamentals; two, to broadly define the materials and their properties, and to integrate these with the products and their applications; three, to bring out the essentials of product and tool design, and to correlate design with the tools and machines used for manufacture; and four, to combine all of these elements into a composite picture that includes the flow of materials from Receiving to Shipping.

The aim throughout has been to give the reader—be he expert or layman in the plastics field—an interesting and comprehensive outline of "what it's all about." Having a grasp of the materials and their characteristics, it is the easier to project the methods of manufacture, while a knowledge of tools—and especially of standardized molds—enables one to more intelligently plan for economical mass production consistent with high quality.

As the title implies, this Symposium represents the general concensus of opinion, of leaders in the industry, as to what is the best and the latest in this comparatively new field—*Plastics*—at this stage of development.

Various authorities and specialists, in addition to TOOL ENGINEER staff writers, have contributed to this symposium. Among these, Mr. Carl Sundberg, of Sundberg-Ferar, industrial designers, Detroit, has afforded us an inspiring vista into future developments in the plastic field, the while he has clamped a not too heavy brake on over-enthusiasm.

Postwar Probabilities

With one exception, the several photographs shown of Sundberg-Ferar designs are on the postwar horizon. And even the exception—the all-plastic automobile body—but awaits further development in materials and techniques of manufacture to become a practical possibility. The products shown, in the photographs, are but straws in the wind denoting trends.

Another noteworthy contributor is Ivar T. (Ted) Quarnstrom, president of the Quarnstrom Tool Company and of the Detroit Mold Engineering Company. Mr. Quarnstrom has pioneered the *standardization* of plastic molds and accessories—an outstanding contribution in itself, and especially in its effect on manufacturing economies.

While Mr. Quarnstrom has contributed materially—in notes, illustrations and technical data—to the chapter on *Tools*, he modestly refused to take a "by-line." However, we are pleased to present him to our readers in a brief biographical sketch, and to gratefully acknowledge his assistance and the aid of the D.M.E. engineering staff.

We also wish to express sincere appreciation to Mr. C. A. Sanford, managing director of the Plastics Industries Technical Institute, and to Dr. Ernest J. Storfer, also of the P.I.T.I. for their splendid cooperation in the preparation of this symposium. We are also indebted to Mr. Byron H. Hoover, industrial engineer with the Midland Steel Products Company, for his chapter on Plant Layout.

Acknowledgment is also due to the Hydraulic Press Manufacturing Company, of Mount Gilead, Ohio, to Lester-Phoenix, Inc., of Cleveland, Ohio, and to the Defiance Machine Works, of Defiance, Ohio for their wholehearted cooperation and for the use of photographs as well as data bearing on the operation of plastics presses and molding equipment. These presses are largely typical of the machines currently used for plastic molding and represent the latest in the field.

With this introduction, and its acknowledgment of sources, we turn this Symposium over to our several authors.

Andrew E. Rylander

Technical Editor.

Carl W. Sundberg **gained his designing experience in the custom automobile body field. In 1934, he joined with Montgomery Ferar to found the firm of Sundberg-Ferar, Industrial Designers. Since its establishment, the Sundberg-Ferar staff has designed a great variety of consumer goods, covering many fields of manufacture. Latterly, the organization has devoted itself to the materials and products for war, but now, with reconversion pending, there will be renewed activity in the consumer goods field.**

Byron M. Hoover **was graduated from Penn State College with a B.S. degree in Mechanical and Industrial Engineering, and gained practical experience with the Philadelphia and Reading Locomotive Works. He served two years with Ordnance in Chemical Warfare in World War I, then, in 1919, joined the Midland Steel Products Company, with whom he is now industrial engineer.**

Ivar T. (Ted) Quarnstrom **was born in Sweden, where he learned tool and die making and acquired a technical education. Coming to America in the early '20's, he worked at his trade as die maker at Detroit Die Casting Company, and as die designer at Hudson Motors and Budd Wheel.**

In 1932, he founded the Quarnstrom Tool Company, specializing in die casting dies and plastic molds. Pioneering the standardization of molds in the latter field, he later established the Detroit Mold Engineering Company, which is devoted to the manufacture of *standard plastics molds*. Mr. Quarnstrom is president of both companies.

# of Manufacture

1. Plastics—The Product

by Carl W. Sundberg

"WHICH of the automobile companies plans to come out, after the war, with a new, transparent plastic top?" That question was recently put to the writer, and, unfortunately, it was not posed in jocular vein. Rather, it typified what altogether too many people are expecting of plastics in the near future.

True, there has been amazing advance, in materials, products and techniques of manufacture throughout all industry since the war. A great deal of this has filtered through the screen of military secrecy, and rumors and reports have been seized upon by the postwar prophets and translated into promises which are rather beyond immediate realization by the practically minded.

Not a "Miracle" Material

As far as progress is concerned, the plastics industries have kept pace with the field; have probably been the pacemakers as far as application of a comparatively new product to emergency demands is concerned. And, because there is a certain magic in the word "plastics," the more romantic among the writers have had a field day in glamorizing plastics as the miracle material of the ages.

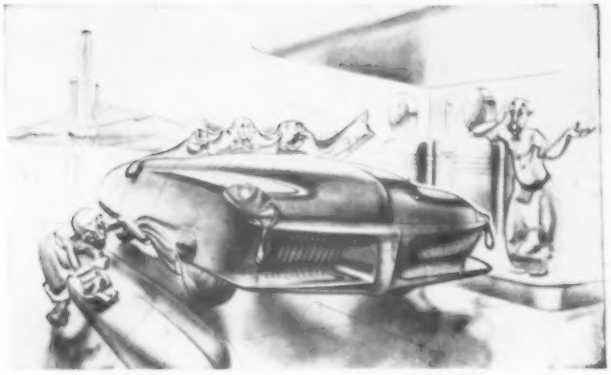
In this connection, we designers have not been blameless. Rather, we have been guilty accessories in that we have used new developments, as announced by the plastics industry, up to and even beyond the fullest limits of their possibilities. Ever casting about for new ideas, we have sometimes yielded to the temptations offered by plastics, and especially with regard to some of those mysterious innovations in war production about which we know a little but not enough.

Because some of the pictures we have drawn, in striving toward a goal, are sensational and, therefore, of the sort to intrigue the imagination, they have been published and have contributed to the misleading of the public. But then, there are extenuating circumstances. As industrial designers, we are artists who work, not with clay, charcoal, paint or music, but with the materials from which the tools of living are made.

Advantages Vs. Limitations

True, we can infuse color and harmony into plastics—few materials are so versatile—but, by comparison with the media of other artists, our medium is comparatively static and flexible only to the point where it can be molded, cast, extruded, hammered and polished at high speed. Because it is faster, we must sometimes use a sharp corner where a radius would be more artistic. Inversely, because of a lower cost factor, we must often use a radius or fillet where we would rather have a sharp corner. And, we can't die-cast one part because it is impractical, nor can we stamp another type because it's impossible.

These are the hard, practical limitations which fence the imagination of the creative person. Yet, when we are offered plastics, with all their versatility and potential beauty, we turn to them naturally and easily. Many important uses for plastics have been developed from ideas worked out on our drawing boards, and there will be many more. Plastics have truly become the designers' material, and this is good, not only for the plastics industry, but for all industry.



The all plastic car is still in the *futurama*. Right now, its lines are altogether too "flowing."

Nevertheless, presentation of unproven if not entirely impractical ideas, to the public, as promises for the immediate future, may result in considerable harm. "Hope, deferred, maketh the heart sick," and public reaction to misconception may foster an ultra-conservatism that, in itself, would be a barrier to future progress.

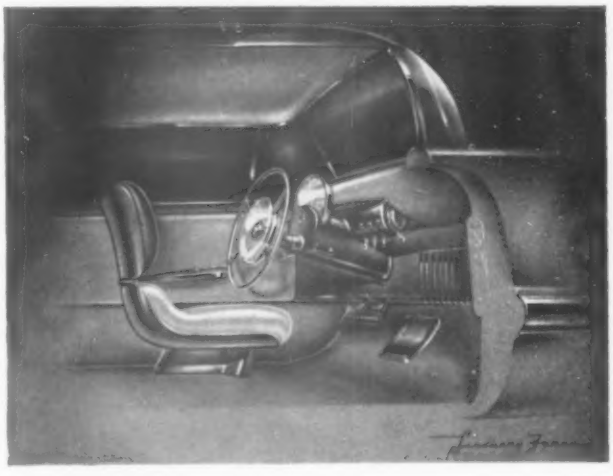
In common with all members of exact professions, plastic engineers incline to conservatism and, in self protection, have barricaded themselves behind a barrier of ultra-conservatism. Having witnessed wild flights of imagination into the amazing plastic stratosphere, to use that term, they have decided to protect their own interests, and those of the industry, by conceding nothing as possible until it has already been done. In fact, the conscientious members of the industry are so concerned over premature publicity that they incline to overemphasize the limitations of plastics.

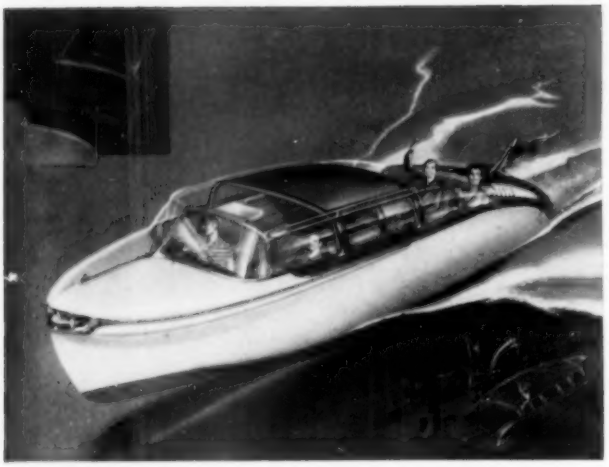
In this connection, the writer holds for a middle ground between extremes. While it is frankly conceded that a disillusioned public would be a serious handicap to an industry whose post-war opportunities are unique and roseate, it would be equally, if not more, disastrous to discourage initiative on the part of designers.

The plastics industry is in its infancy and, like all new things, will suffer growing pains. And, while misleading statements may alienate future customers and, thereby, foster some sales resistance, this need not be a serious handicap provided that the plastics industry takes pains to shape its own current frame of mind.

The industry should make every effort to control what is published about its product, but, it should also encourage flights of fancy. The history of progress is illuminated with impossible dreams that, eventually, resulted in some of our

Plastic instrument panels and accessories are already here, but portend greater improvements and wide applications in the automobile of the future.





The Plastic Cruiser. Rot, termite and leakproof—and truly streamlined. Note flow lines into detachable power unit.

greatest advances. Dreams have been, and will continue to be, necessary to normal progress, and it is entirely reasonable to assume that many applications of plastics and the techniques of processing will start with presumably impractical ideas. Therefore, rather than discourage the creative dreamer, discourage the publication of his fancy as fact.

As industrial designers, charged with the responsibility of suggesting and employing the right material for the job, we incline to a middle-of-the-road course. We must dream, and create, because that is our business, but we must also realize our dreams in workable ideas and saleable products.

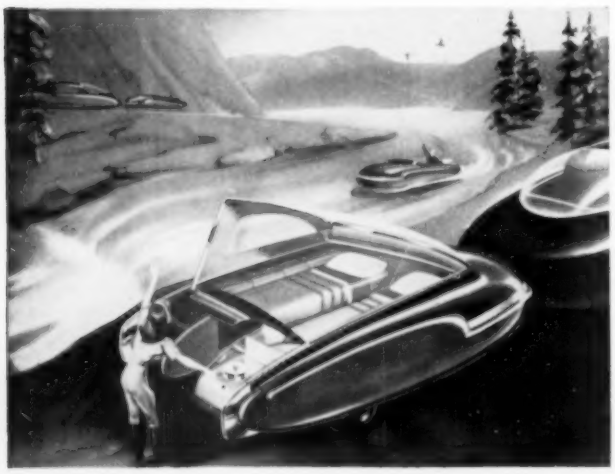
Greater Beauty Possibilities

In the strictest sense of the term, plastics are what the name implies—*plastic*. They are workable by various methods and processes, and possess an inherent beauty that lends itself to unique and distinctive treatment. They offer unlimited opportunity for new development and, where a well chosen plastic possesses the required physical properties, it is almost certain to surpass other materials aesthetically.

Coming back to automobiles, it is entirely possible that, at some time in the remote future, automobile bodies will be made of some plastic material. However, accomplishment is still so remote, that, at this time, it is merely within the realm of "possibility" thinking. It is a spectacular suggestion which, while apparently reasonable in view of remarkable wartime techniques, is still beyond the practical horizon.

True, many of our contemporaries have prophesied the

The amphibian "Boatrailer," suggested by Sundberg-Ferar, provides snug living quarters at camp or lakeside.



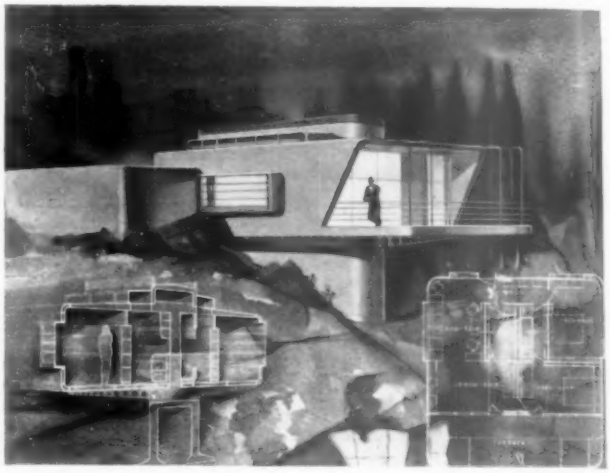
manufacture of bodies by low pressure molding of plastic-impregnated fibrous materials. Without going into involved technicalities, however, the cold fact is that the optimum molding cycle, at this stage of development, is far too slow to keep pace with the demands for automobile production.

Since transparent noses, gun turrets and blisters, on war planes, have proven themselves practical—but in cool, high altitudes—the super optimists have transposed them to the immediate postwar automobile in the form of windshields, windows and—of all things!—tops. Actually, however, even the hardest of today's plastics materials have been tested for these purposes, and have been found wanting. Hence, they have been ruled out of the immediate picture.

Cannot Withstand Extreme Heat

Plastics, at this stage of development, can withstand just so much heat, and what would happen to a "plastic car" under the high temperatures of the desert is well illustrated in an artist's fancy of a plastic car under such conditions.

However, there are numerous applications for plastics in automobiles, some of them already in use, with others on the immediate horizon. The possibilities of their use in interiors are practically unlimited and but superficially suggested in the photograph of a car interior. For that matter, the possibilities of prewar materials and methods have by no means been ex-



The pre-fabricated Plastic Home, with all utilities and conveniences built in, is supported on a small concrete foundation and cantilever beams.

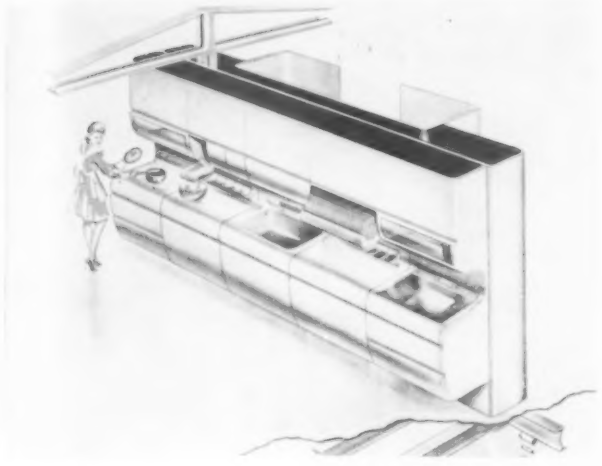
hausted. There is still to be considerable development in dashboards, instrument panels, and so on, with broadened opportunities in this direction.

Inportant advances have been made in the treatment of fabrics, and a recently developed material for seat covers has met with unqualified approval by all who have tried it. At any rate, there is room for improvement in trim and upholstery materials, and, unquestionably, the plastics industry will supply an ideal material with all its inherent beauty and wearability.

Opportunities in Boat Building

One of the most tradition bound industries is that of boat building. Here, however, as with many other industries, the maintaining of tradition has largely been forced by the limitations of material. To achieve functional shapes, wooden hulls —and metallic until recently—have had to be hand fashioned by master craftsmen, the best of whom have had their own ideas regarding shape.

Here, the plastics industry has opportunity for a real contribution of new materials and methods. While admittedly slow, as compared to stamping of automobile bodies, low pressure molding of hull sections—or even of complete hulls—



The housewife's Utopia—a *plastic kitchen* unit in which low pressure moldings provide fixtures integral with wall sections.

would nevertheless be considerably faster than the building of wooden hulls by hand.

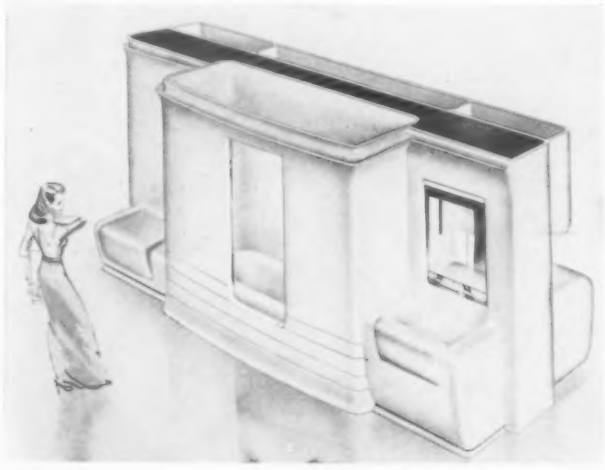
Scientifically designed shapes—perhaps new designs of rounded bows for cushioning wave slap, which might be practically impossible to achieve in the case of wooden hulls—could be developed and standardized. Many plastic materials offer advantages over wood, as lighter weight with greater strength, freedom from leaks and resistance to dry rot and termites and—who knows? barnacles. At least, there should be no need of painting with the hard, durable surface finish of plastics.

Cruiser with Removable Power Plant

The light cruiser, shown in the photograph, has the novel feature that its entire power unit is enclosed in a separate housing which is detachable for servicing. Note, however, that its design lines carry through with those of the hull. There are many advantages in having the engine outside of the hull proper. Gas fumes, notorious for explosions in power craft, may be entirely eliminated since the bilge is always clean of oil and grease; besides, the absence of machinery in the hull tends to confine vibration to the power unit, which can be cushioned at its mounting points. Everything considered, molded shapes would not only provide economy in manufacture, but would give the designer opportunity to truly streamline the cabin—also a practical impossibility in wood construction.

Further pictured is an automobile trailer that can be used as a skiff or as an outboard shell. Such an item would not entail high speed production, hence low pressure molding of a suitable material in beautiful and functional shapes could evolve into a truly presentable and versatile automobile trailer. As the photograph shows, it could even be used as a camp bed or as complete camp living quarters.

The all *plastic bathroom*, back to back with the kitchen. Hot water, heat and air conditioning provided for in the space directly above.

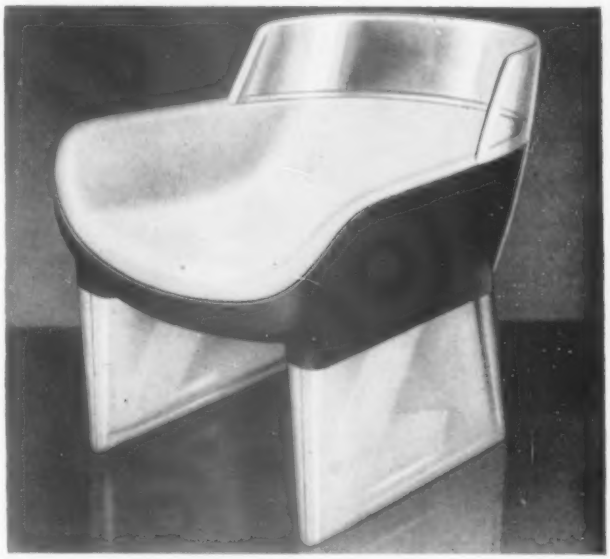


Plastics will also play an important part in future, permanent homes. Even before the war, prefabrication had become an important factor in the building industry, and its importance will increase with the postwar demand for low-cost housing. Plastic-bonded woods, and other laminates, will undoubtedly take a leading part in this field; here also, as their production becomes more diversified, will be found new and broader uses for treated fabrics.

Big Possibilities in the Home

Bathrooms and kitchens, especially, provide fertile ground for development. Today, we have shower curtains, counter tops and innumerable "gadgets"—some good and some indifferent—of plastics, and we can foresee medicine cabinets, plumbing fixtures and furniture—even the walls themselves—of plastics in a variety of pastel shades. A complete home, with kitchen and bathroom units and a suggested chair, is photographically illustrated.

Well, these are highlights, but all within the realm of practical possibility. We see these things as product engineers,



An all plastic *chair*, made possible by new molding techniques and newly developed materials.

making no particular claim to being plastic experts. However, we are vitally interested in the plastics industry, and as vitally concerned with its progress. We have seen plastics misused through misinformation, have even seen them misrepresented by overenthusiastic and unscrupulous manufacturers.

Steady, Substantial Growth

In a measure, we feel responsible for public misconception resulting from sensational "world-of-tomorrow" prophecies made by some in our own profession. Yet, we would not stifle initiative and incentive; rather, we have every belief that the plastic industry will grow in scope, as sincere a hope that it will grow solidly. We want to share in its development.

In the final analysis, however, it may be said that where well chosen plastics meet physical requirements, they will also surpass, in adaptability and in aesthetic qualities, most of the other materials used in the manufacture of consumer goods. Therefore, their development warrants the fullest encouragement, on the part of manufacturers as well as of consumers.

2. Plastics–Their Properties

by Gunnar Skog

WHILE it is not proposed to go into the chemistry of plastics, since that is largely outside of our field, a general resume of their properties is entirely in order for a broader grasp of their applications and techniques of tooling. Especially so since this comparatively recent entrant into the field of mass production promises to have a brilliant future.

Plastic products are made for various purposes, some ornamental, some entirely utilitarian while some—a growing proportion, because of sales appeal—combine both utility and pleasing appearance. Some are resistant to acids and chemicals, some to heat—i.e., comparatively—and most are dielectric and therefore suitable as electrical insulants. While the products range from gossamer threads to heavy rod, and from the familiar cellophane to thick sheets, all are moldable by some method or other.

Thermosetting Types More Permanent

In the main, but not entirely, plastics are composed of resins which may be broadly divided into two major groups—the *thermoplastic* and the *thermosetting*. While these, in turn, are divided into sub-groups, and widely diversified, they share certain properties, one of which is that they may be molded by injection or compression.

An intermediate group is composed of the cast phenolitic resins and cellulose nitrate. The first, of a semi-fluid consistency, may be cast in molds, when, after an interval, it hardens at a comparatively low temperature. It is translucent, lends itself to an infinite range of color, is non-inflammable and a good electrical insulant.

Cellulose nitrate—which, incidentally, is quite flammable—may be rolled into sheets or extruded into rods. Both are thermoplastic; however, since neither is suited to injection or compression molding, their processing will not enter into this discussion.

Coming back to the two main groups, the thermosetting plastics undergo chemical changes when molded, hence, their molded form is permanent. They cannot be reshaped or reclaimed by softening, and on the whole they are insoluble. Their molding temperature is higher than that of the thermoplastics, and they can withstand a higher heat—350° F. more or less—without appreciable injury.

Thermoplastics Soften at About 140°

The thermoplastics, on the other hand, undergo no particular chemical changes in molding, and although hard at ordinary temperatures, begin to soften and deform at about 140° F. They return to a plastic state when heated. Outside of these differences, however, both types are largely alike and any may be considered moldable by injection, compression, rolling or extrusion.

The thermosetting group includes all of the urea resins and a number of the phenolic plastics, among them the familiar and widely used Bakelite. As a rule, these are mixed about 50-50 with a filler. They are insoluble and, as any or most of the desirable qualities may be found in any member of the group, they may be termed the best of the general purpose plastics.

The thermosetting plastics also include Melamine, which is related to the ureas, and the synthetic rubbers, of which the oil resistant Neoprene is finding such a wide use in industry, and especially for hydraulic packings and flexible conduits.

Among the thermoplastics may also be mentioned styrene, shellac and rubber, all of which may be reclaimed and reworked, the latter usually in combination with an infusion of crude or latex. Rubber, as we know, can be rolled into sheets, embossed, molded or extruded and, when vulcanized, withstands an inordinate amount of wear and abuse. Its range of use is almost unlimited. However, it becomes brittle at extremely low temperatures, (so does steel), deteriorates under sunlight and, while resistant to most acids, will not withstand the action of oil.

Also to be included are the Acrylic resins, of which Lucite and Plexiglas are familiar products. These are of clear resin base, and may be injection or compression molded, as well as extruded. They have high tensile strength, withstand severe flexing, have excellent dielectric qualities and are resistant to water, acids, caustics and solvents. Transparent or translucent as the case may be, they are both utilitarian and decorative, a familiar use being for Milady's hand mirrors and boudoir accessories.

Insulating and Water-absorbent Types

Other types are ethyl cellulose, which is both moldable and extrudable, withstands low temperatures and is a good electrical insulant; and cellulose acetate, which is strong, a fair electrical insulant although hygroscopic—i.e., it absorbs water—and not so weather resistant. Allied to this sub-group is cellulose acetate butyrate, which is less hygroscopic and more resistant to weather. In common with the others, it is adapted to injection and compression molding, and to extrusion.

One must also include the bituminous compounds, the resinoids and cements—in fact, anything which, by virtue of temporary semi-fluidity and/or properties of cohesion, may be molded, rolled, extruded or briquetted into shape and, once so formed, will retain its shape within the limits of its designed function. While metals are excluded in the main, it is entirely within reason to include the powdered metals, since these may be molded or shaped by methods largely similar to those used for processing plastics. Here, however, we are entirely concerned with non-metallic products and their application to modern uses, and as stated in the opening paragraph, this resume is designed for a generally broader grasp of tooling and application.

3. Plastics–The Tools

by Anders Jansson

Rules for Design

NUMEROUS rules have been laid down for the design of plastic products, for best molding conditions. And, while by no means arbitrary, they have been proven out over a period of time and have been found workable up to the present stages of plastic development. As with all things, however, there will be modification and revision as the Plastics industry develops, and especially as applications are broadened by newer and improved compounds and techniques of manufacture.

The essentials of these rules are outlined below, but in order as they come to mind rather than in sequence of relative importance. All are important and should be interrelated for best results, not only from a viewpoint of manufacture, but for durability of the product itself. They are:

1. Use the cheapest material consistent with quality of product and the purposes for which the product is to be used.

2. Design for easiest and simplest contour flow, so that this will result in the simplest and most rapid molding.

3. Avoid close limits unless absolutely necessary since, as with all die-cast products, extreme accuracy adds materially to cost of tools. It may prove more economical to machine precision dimensions as a later operation.

4. Hold overall sizes to a minimum and, if possible, design for average uniform section thicknesses. This rule, however, will modify considerably as new techniques permit molding of larger parts.

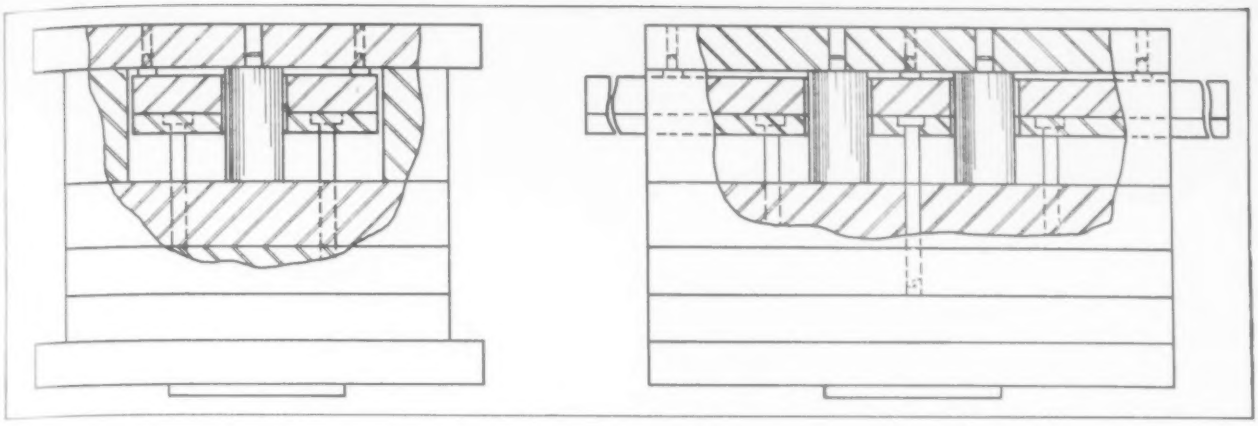


FIG. 1. Supporting pillars, judicially spaced, increase permissible cavity areas several fold.

5. Avoid deep draws if shallower ones will serve as well, but whether deep or shallow, allow plenty of draft.

6. Design so that flash parting will be accessible for easy finishing, as by grinding and buffing.

7. Avoid large flat surfaces, but when such surfaces are necessary, provide ribbing for stiffening whenever possible.

8. Design for good parting and easy removal from molds, and so that push pins will not markedly mar surfaces. Avoid split sections as far as possible.

9. Provide ample fillets and round corners, as these tend to relieve strains and to prevent cracks that might be caused by sharp corners. This does not mean that sharp corners are taboo, but that the round are preferable.

10. Hold inserts to a minimum, but when used, provide plenty of meat around them. If inserts are to be tapped or otherwise machined, they should preferably be of brass since this material is non-rusting and may be machined with less strain than ferrous inserts.

11. If the part is to have lettering or embossing, have the embossures parallel to the line of parting and, preferably, centering on a line 90 degrees from the part so that entire design remains clear cut when removed from the molds.

Taken all together, these rules are not inflexible, although some, if not all, will apply in the general run of product design. One can't go far wrong by following them, while deviating calls for considerable discretion on the part of the designer. The main consideration is the behavior of the material under particular conditions of molding and application.

Good Steel Essential to Mold Fabrication

After design, the next and essential item in the making of plastic molds is the steel used in their fabrication. And here, the first material used was undoubtedly mild steel, carburized and hardened. While adequate for many purposes, this material does not compare favorably with the late alloys—as SAE 4615, 3120 or 3312, which have largely replaced the mild carbon steels except in the case of hobbing steels.

While mild steels gave a hard core—say 60-62 Rockwell "C"—the core had little more strength than prior to heat treatment whereas, in the case of the alloy steels, core strength may run as high as 130,000 P.S.I. Surface hardness remains as before, usually around 60 Rockwell "C" or over.

In hobbing steels, especially, the need for core strength is much greater, and this has prompted the use of such steels as SAE 3110. One steel company is developing an oil hardening type of steel for this purpose, although it is not yet ready for general distribution.

Generally, oil and air hardening steels are used for cavities, with hardness varying from 48 to 65 Rockwell "C", depending on the steel used and its heat treatment. Naturally, those steels that harden all the way through attain maximum hardness as quenched; since, however, the important consideration is core strength, hardness becomes a subordinate factor and the steel is further treated and drawn to bring out the requisite properties.

The amount of reduction, necessary to hardness, will depend entirely on the steel and will vary considerably. It may be anything. As an example, one popular oil hardening steel will scale up to Rockwell 64-66 "C", as quenched. But, as shown below, this hardness falls in direct ratio to the rise in tempering temperatures, viz:

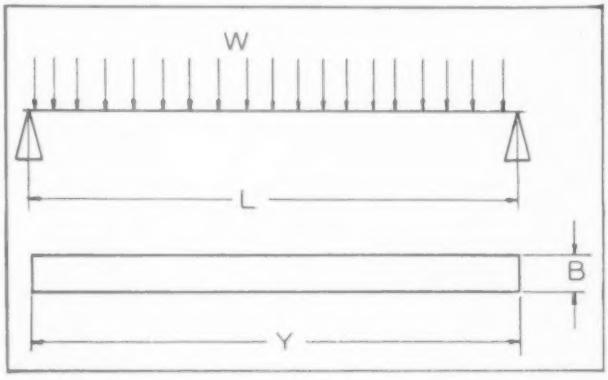
Tempering Temperatures, in Degrees F.	Hardening Rockwell "C" Scale
As Quenched	64-66
250	63-65
300	63-65
350	62-64
400	61-63
450	59-62
500	58-61
600	55-57
700	51-53

However, maximum toughness, with little drop in hardness, is attained at 450° F., and while further tempering will toughen the steel, it will be at the expense of hardness. When normally heat treated, some oil hardening steels—as SAE 6145—will attain a maximum hardness of Rockwell 48-50 "C." However, this steel can be cyanided and quenched in oil, which will give a surface hardness of 58-60 Rockwell "C" while, at the same time, providing for desired core strength. Incidentally, this treatment results in maximum distortion.

One material that has been meeting with increased favor and success, for cavity material, is Beryllium copper, cast. These castings can be hardened to 38-42 Rockwell "C" and take an excellent polish. Naturally, the use of cast cavities implies a considerable reduction in fabrication costs.

Actually, the question of steel, and high hardness, is highly

FIG. 2. Clamping pressures may be calculated by formula, in which the support plate is treated as a uniformly loaded beam.



controversial at this stage of development. Some molders are satisfied with 48 Rockwell "C", others with 54 "C", while others, again, will accept nothing under 60 "C". However, there are molds in service, and operating economically, with hardness as low as 85 Rockwell "B", while others again soar to Rockell 65 "C". Apparently, the industry is unanimous on one point—complete disagreement as regards cavity hardness.

Taking a sensible approach to the question, however, the analysis of a steel, and the heat treatment used, will largely determine its hardness. And while hard cavities are desirable, toughness should not be sacrificed to hardness. The right procedure is to select a steel that, with normal heat treatment, will show best results on the job.

Good Mold Design Cuts Production Costs

The standard mold bases shown herewith, as well as the several cavities and specialties, are the product of Detroit Mold Engineering Company.

The reason for stressing toughness, rather than hardness in the steel used for plastic molds is that the high pressures occasioned by compression molding—and especially where large areas are involved—tend to distort the cavity. And, since a common cause of excessive flash on molded parts is lack of strength in the mold itself, it is necessary—and especially in the case of high pressures and large areas—to properly support the cavity plates to avoid sagging.

Support may be effected in either of two ways:—by resort to very heavy plates, or by use of supporting pillars, as shown in Fig. 1. The latter is the more practical method since the pillars are easily constructed and do not increase weight or dimensions of the mold. Thus, material is saved, while the thinner plates permit of shorter and, therefore, stronger ejector pins.

Another point in favor of supporting pillars is that they may be placed close to points of maximum stress without in any way interfering with other functional parts, as ejector pins, cores and so on. In this connection, it has been demonstrated that the average clamping pressure, necessary for best results, is about 2 tons p.s.i. and may scale to 32 tons, all depending on the material to be molded and the sizes of nozzles, gates and receivers. These loads may be calculated by the formula shown below, in which the support plate is treated as a uniformly loaded beam, as in Fig. 2.

$$W = \frac{8\,Z\,S}{L} \qquad Z = \frac{YB^2}{6}$$

in which:

W = Permissible load on support plate in lbs.
S = Permissible working stress (12,000 lbs./in.^{2})
L = Distance between supports in inches
Z = Section modulus (ins.^{3})
Y = Length of support plate in inches
B = Thickness of support plate in inches
P = Maximum unit pressure on support plate (7,000 lbs./ins.^{2})
A = Permissible cavity area.

Taking a No. 2 (D.M.E.) plate, without pillars, as an example, we have:

$$Y = 12''; \; B = 1.875''; \; Z = \frac{YB^2}{6} = \frac{12 \times 1.875^2}{6} = 7.032 \text{ in.}^3$$

$$W = \frac{8\,Z\,S}{L} = \frac{8 \times 7.032 \times 12000}{6.125} = 110{,}208 \text{ lbs.}$$

$$\frac{W}{P} = A = \frac{110{,}208}{7000} = 15.7 \text{ in.}^2 = \text{Permissible cavity area.}$$

If, now, we consider the same base—i.e., No. 2—with 4 pillars thru the center, in which case L = 3.062", we will have:

$$W = \frac{8\,Z\,S}{L} = \frac{8 \times 7.032 \times 12000}{3.062} = 220.416 \text{ lbs.}$$

$$\frac{W}{P} = A = \frac{220{,}416}{7000} = 31.4 \times 2 = 62.8 \text{ in.}^2 \text{ Permissible Cavity Area.}$$

We see, then, that the permissible cavity area has then increased fourfold by the use of 4 pillars, and, if we increased these to 8, spaced in two rows, the cavity area would be increased to 141.6 in.^{2}—more than eight times as much as would be permissible without pillars. And all this is accomplished without appreciably adding to weight, dimensions or costs.

Standardization

To a great extent, the remarkable economies in modern industry have been achieved through standardization, and it follows that, as the plastics industry grows, it will incline more and more toward standardization. This holds especially for the molds which, next to the machines, are one of the costliest items in the production of plastic parts. For that matter, the molds are the costlier considering that they are perishable, whereas the machines may be considered as capital investment, to be amortized over a period of time.

As in the case of the sheet metals and steel stampings industries, where die sets have been standardized, with commensurate economy, standard mold bases have been made available to the plastics industry and are now widely used.

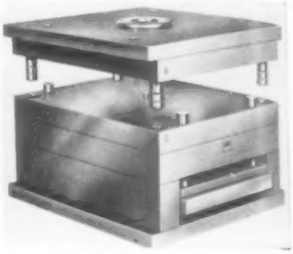


FIG. 3. An outstanding achievement in the economies of plastic manufacture — the *Standardized Mold* pioneered by Detroit Mold Engineering Company.

In addition to standard mold bases, of which a typical Detroit Mold Engineering set is shown in the photograph, Fig. 3, ejector pins (Fig. 4) have also been standardized, thus providing for quick replacement from stock in the event that pins should wear or become damaged in use.

In loading ejector pins, the designer must take several factors into consideration, as, for instance, the deformation of parts, caused by ejecting, and marks in the molded product, caused by the pins, which must later be polished out. Also, sticking of pins to the product should be avoided, since this tends to slow production.

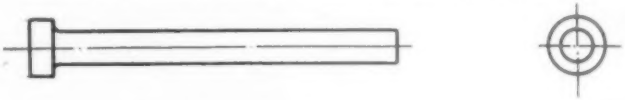


FIG. 4. Quickly replaceable, Standard Ejector Pins effect further economies in plastic molding.

While these difficulties are usually obviated by use of stripper plates, molds so equipped can only be used under certain conditions, largely depending on the shape of the part being molded. Therefore, ejector sleeves are recommended on parts that have cored holes—provided, that is, that wall thickness of the sleeve can be made heavy enough to prevent breakage.

Fig. 5 shows a method of preventing ejector pins from marring a part by resort to overflow. Considerable care should be exercised in determining the shape of this overflow although, if properly designed, a minimum amount of flash will be left in the molded part.

Short Gates Advisable

The gates (shown at "C" in Fig. 6) should be as short as possible—say 1/32" or so. The angle (D) should be about 45°, and the distance "E" at least three times the diameter of the pin. This precaution is necessary to prevent tipping of the lug, with probable hazard of failure, during ejection. As an extra precaution, a slight chamfer—or rounding—at "F" would prevent the edge of the lug from breaking off when removing the part. Fig. 7 shows a typical, convenient installation of ejector pins in a multiple mold.

Also, on the list of standard specialties, may be included

sprue bushings, of which an improved design is shown in detail in Fig. 8, and in assembly in Fig. 9. As may be inferred from the latter, design is such as to greatly facilitate removal of the bushing or the clamping plate.

These, and other specialties in connection with plastic molds, are mentioned and illustrated here because they have become essential units in mold fabrication and portend marked economies in the production of plastic products. Manufacturer's literature, with all essential data, is available to the interested and should be included in the designer's technical library.

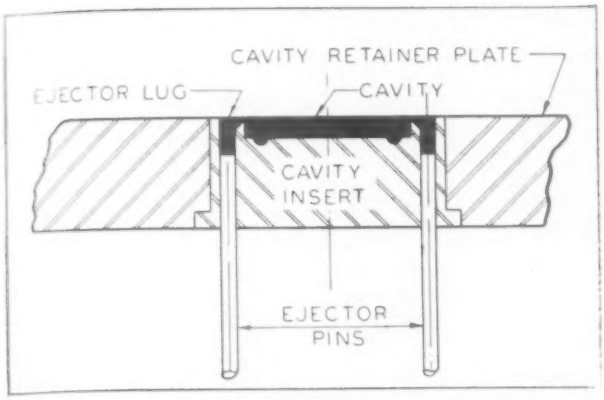


FIG. 5. **"Overflow," on part being molded, prevents marring by ejector pins when part is ejected from mold.**

With regard to the design of molds, a rather ingenious example is shown in Fig. 10. The part (which is shown in Fig. 11) requires cores to be drawn in three directions, the whole calling for extreme nicety of design considering that the demands of production necessitated four cavities in the mold. That is, four parts are produced simultaneously.

As will be seen by referring to Fig. 11, two brass inserts are molded into the part, and opposed cores are required to hold these inserts in place during molding. In addition, the rectangular window also requires a core.

The core for the latter is pulled by a conventional cam and locked by a small heel block entirely contained in the front cavity retainer plate. (See section D-D). However, pulling the cores for the inserts, in a similar manner, would have made loading of the inserts rather difficult. Hence, resort to the ingenious mechanism shown in Section C-C.

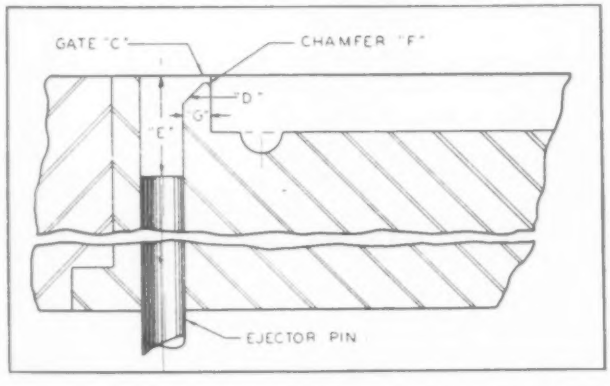


FIG 6. **Cross section of mold with "overflow," showing preferred proportions.**

Round pins, 1½" in diameter, were mounted on gibs, at an angle in the ejector plate so that the forward movement of the latter forced the ends of the pins away from the cavities both vertically and horizontally. The cores, which hold the inserts, are attached to the ends of the pins, and the motion serves to strip the castings from the mold as well as to remove the cores from the inserts. Incidentally, attention may be called to the sprue bushing, described above, which is here shown in place in view A-A and Section C-C.

Another example of cam molds, made with standard parts, is shown in Fig. 12. This is a six cavity die, with the cavities cut directly in the cavity plates, which are left unhardened. However, the cam slides and heel blocks are made from alloy steel, and hardened, while the cam pin is of mild steel, carburized and hardened. The mechanism shown is simple to make and easy to adjust and, with variations, is one of the most widely used. Note the location of the single ejector pin, this being a standard of the type described above.

Tolerances

Under rules for plastic molding, a brief reference is made to tolerances. However, this is one of the most mooted of the many factors that enter into mold design, and warrants not only serious consideration, but the closest possible understanding and cooperation between designers, mold makers and molders—yes, and even the consumer of plastic products.

In this discussion, it should be obvious and, therefore, quite understandable, that unnecessarily close limits of tolerance add considerably to the cost of mold fabrication. It should be equally obvious that, if there were no limit to the time or money to be spent in the manufacture of a mold, neither would there be a limit, inside of ultimate zero, to which tolerances might be held.

In practice, however, it happens that most molds are built to prices and delivery dates that are both close and short, and which preclude anything beyond reasonable tolerances. For that matter, few mold shops are equipped to work to gage tolerances nor, in the final analysis, are such tolerances either necessary or practical.

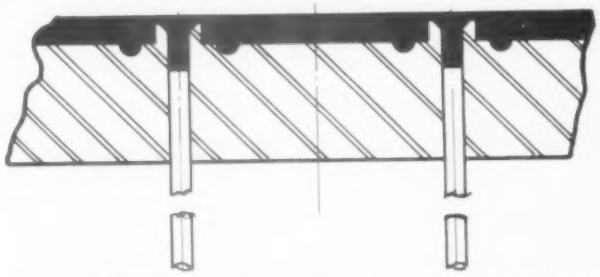


FIG. 7. **Typical installation of standard ejector pins in multiple, standard mold.**

With these considerations in mind, we may critically examine the various factors that bear on mold tolerances. In this approach, we are mainly concerned with fostering the understanding referred to above, and will, therefore, deal with tolerances that, over a period of time, have become more or less standard practice.

Cavity Limits

1. The one valid criterion for cavity tolerances is the limits specified by the plastic consumer on his part print. All cavity tolerances stem from this one source, and the limits stated on the mold drawing must be considered arbitrary clauses in the contract to manufacture. Practical or impractical, reasonable or unreasonable, the mold manufacturer is expected to work to these limits.

2. The tolerances specified for the product must be bettered in the mold. Aside from all consideration of whether tolerances may or may not be practically held, the fact remains that, to hold dimensions within a given range on a molded part, the mold itself must be held to a much smaller range.

As an example, if it is required to hold limits plus or minus .003" on a molded part, the cavity of the mold must be held plus or minus .002", or even plus or minus .001". This is so because, should the tolerances represent the variations in the workpiece due to molding, or to variations in batches of

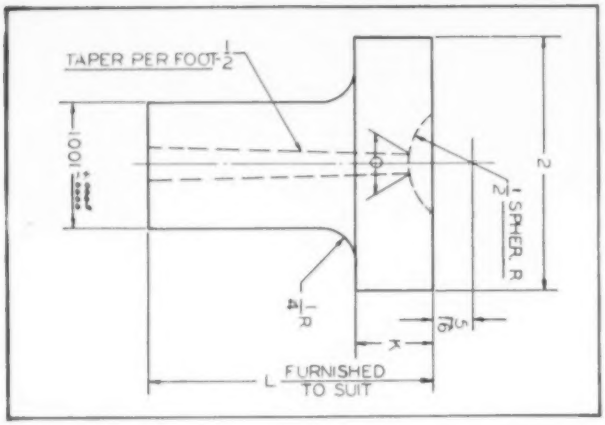


FIG. 8. **Standard *Sprue Bushings* facilitate fabrication of plastic molds.**

plastic material, and the mold is already built to high or low dimensions, these molded parts which vary in the same direction as the mold would be out of limits.

3. The type of plastic material to be used indirectly affects mold tolerances. Should the material have a high piece to piece variation, the mold must be closely held to insure uniform moldings. Peculiarities of plastic material sometimes necessitate very close tolerances and fits,—as for example, jet molded phenolics and nylon, which require as close a fit as possible on ejector pins, to keep them from flashing.

4. To a considerable extent, the method of finishing cavities controls the limits it is possible to hold. If a cavity can be ground after hardening, plus or minus .005"—or even closer—may be held. If, however, it is necessary to finish mill before hardening and then to finish by hand, as much leeway as possible should be given the mold maker. Considering that the difficulty of holding to any given tolerances, in such a case, is directly proportionate to the amount of hand work necessary before and after hardening, one cannot, here, possibly specify an average working tolerance.

5. Along with tolerances, one must consider the type of steel used in a cavity. If the cavity is to be ground to finish size, the steel becomes a negligible factor. If, however, grinding cannot be done, then minimum tolerances may best be held with non-deforming types of steel, such as air or oil hardening types. In this respect, water hardening steels are usually

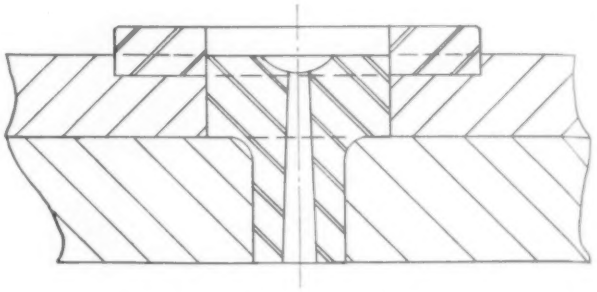
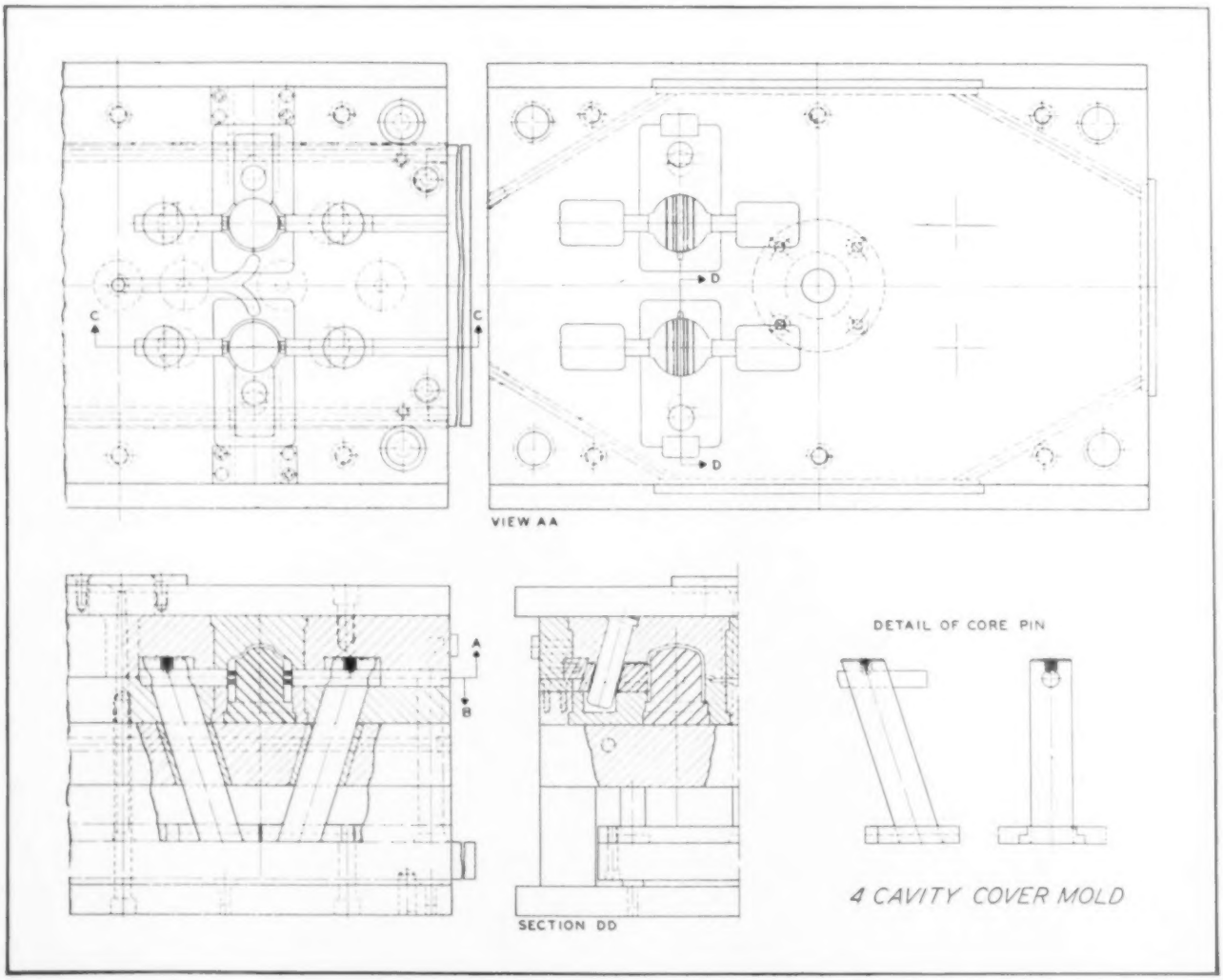


FIG. 9. **Sprue bushing shown in place in standardized plastic mold.**

FIG. 10. **An ingeniously designed cam operated mold for molding four pieces simultaneously.**



poor and not to be recommended. Carburizing steels also tend to change in hardening and, as a consequence, should only be used where this characteristic will result in no particular harm. For injection molds, non-ferrous alloys—such as beryllium copper—and electroplating may be depended on for making cavities with tolerances plus or minus .002″.

6. The larger the cavity, the greater the distortions due to heat treatment and, as a consequence, the greater the difficulty in holding to close tolerances. On the other hand, extremely small cavities, and especially those that must be worked out by hand, are equally difficult to hold to close dimensions. Also, it is more difficult to make several cavities alike than to make one to a given size. Therefore, the greater the number of cavities the more reason for broad tolerances.

One can, of course, prepare special tools with which to duplicate a number of cavities. Such tooling, while an added expense in itself, would nevertheless effect economies in fabrication and also provide for closer limits on the job.

7. To a considerable extent, mold construction determines the necessary tolerances of a cavity. The optimum condition, of course, would be a simple impression sunk into a single block of steel. Next in line would be stationary sections set onto or into a cavity, and while this would simplify machining, they would have to be accurately located and fitted. Ordinarily such sections are lightly pressed into the cavity.

Inserted sections that leave the cavity each cycle, for loading inserts or for removal of the part, should have minimum clearance and yet operate without binding. Usually, .005″ per side will suffice. Where a number of sections are used to build up large cavities, and must be held together in a chase or bull-ring, the several parts may be accurately ground and then shrunk or solidly pressed into the chase. Here, too, a tolerance of plus or minus .005″ in section thickness will do.

Tolerances on Other Parts of the Mold

1. CLEARANCE BETWEEN MOVING PARTS:

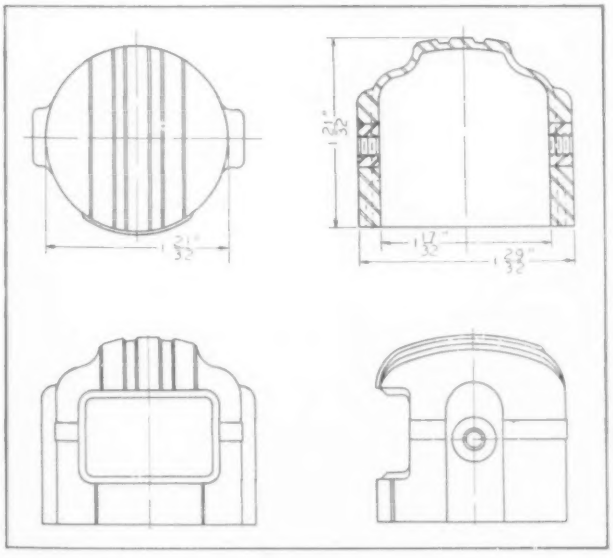
(a) *For slides and moving cores:*—.002″ to .003″, with greater clearance for molds that are to run at high temperatures, to allow for expansion.

(b) For molds operating under high material pressures a much closer clearance will be necessary, to prevent flashing.

2. INTERLOCKING PARTS:

(a) *Cavities and cores:*—As in 1 above, heat and material pressure will determine clearances—.001″ to .003″.

FIG. 11. **The part, as molded in the cam operated mold shown in Fig. 10. Note the window and opposed inserts, requiring judicious coring.**



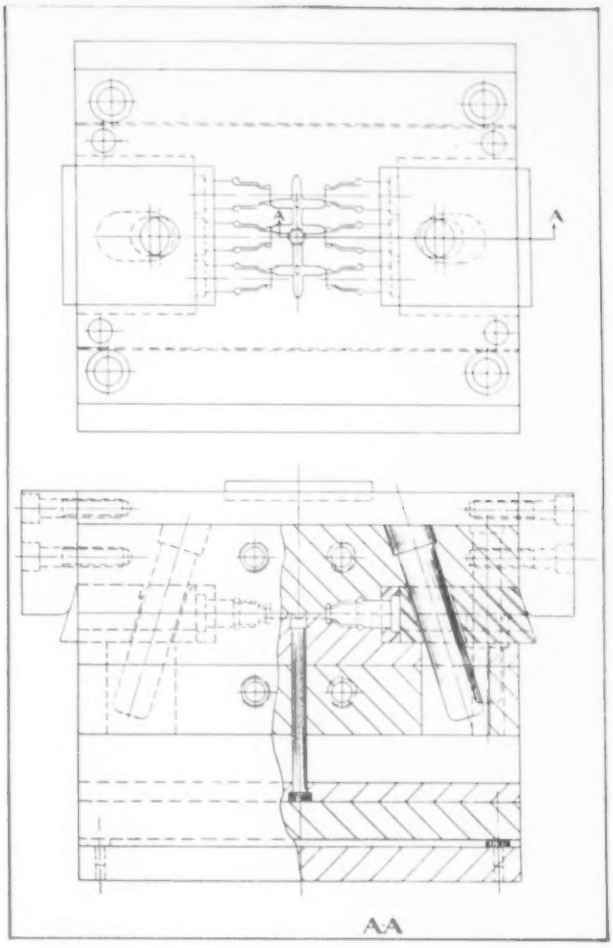


FIG. 12. **A six cavity, cam operated die on a standard mold base. Parts ejected by one centrally located ejector pin.**

(b) *Well or bulk factor* and force plug or punch:—.002″ clearance per side with vents where needed for escape of excess material.

(c) *Transfer pots and plungers:*—.002″ clearance per side for the last half inch of travel, or with .010″ to .020″ taper to top of pot.

3. PILOTED CORES:

Wherever possible, all small cores should be piloted, and larger cores should also be piloted to insure perfect alignment with the rest of the casting. Clearance between core and pilot hole should be .001″—.003″.

4. EJECTOR PINS:

Allow .0005″ to .0015″ clearance, and relieve holes 1/64″ to 1/32″ on the diameter to within 3/8″ minimum of cavities or molded parting surface.

5. ROTATING PARTS:

Unscrewing devices should have from .001″ to .003″ between parts; however, mold temperatures and molding pressures may force modification.

6. WEDGES:

Cam locks and heel blocks should have .002″ to .010″ locking pressure, all depending on the type of lock, wedge angle and machine closing pressure.

7. GUIDE PINS AND BUSHINGS:

Standard clearance is .002″, but where molds run hot .004″ is in order. For very close work, a metal to metal fit for the last 1/4″ of pin is used.

In the foregoing treatise on tools—or, in plastics nomenclature, the molds—we have largely confined ourselves to essential principles and, as with the other phases discussed, have tried to give the reader a comprehensive grasp of "what it's all about."

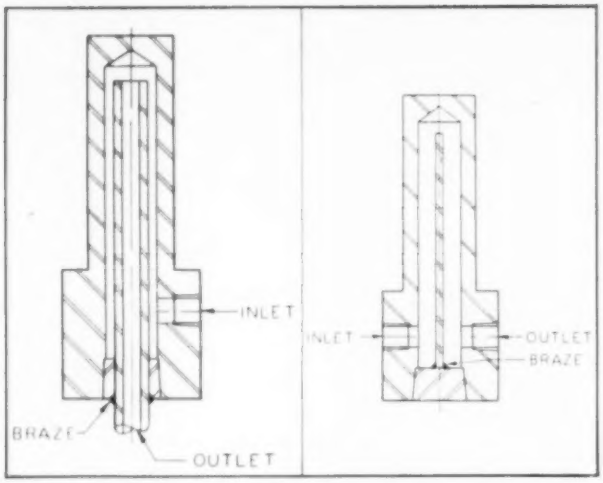


FIG. 13. Core cooling has also become included among the standards. Circulation of water in this typical design is by return tube.

FIG. 14. A water cooled core plug, somewhat similar to that shown in Fig. 13, but employing a dividing wall for opposed side outlets.

True, the art has borrowed—to use that term—from other crafts, as permanent mold casting and die casting—yes, even from electric butt welding, where the electrodes are often water cooled. Plastic molders now employ water cooled cores for better molding, as illustrated by the simple, water cooled cores shown in Figs. 13 and 14. However, cooling channels may be drilled or otherwise worked into molds, the method depending on the individual job.

In conclusion, it can be said that tooling for Plastics implies not only ingenious tool engineering, but precise and painstaking workmanship on the part of the mold makers. That is plainly evident from the examples shown. However, the art is progressing rapidly, with portent of advances in tooling techniques and materials far beyond anything so far arrived at.

4. Plastics—The Machine

by Rex Heath

AS WITH all modern mass production techniques, the manufacture of plastic products calls for machines, tools and equipment of the highest order. And, considering the comparatively brief life of the industry to date, the machine builders have not only met the needs of the day, but have anticipated the demands of the future. The machines shown, while only a few out of many, are outstanding examples of sound engineering, clean design and rugged construction.

The machines shown have been carefully selected for their application to the subject, and while there is naturally some overlapping of functions, the three makes may be said to cover the entire range of modern plastic molding. They include transfer presses, and injection and compression presses, and embody the latest in control mediums—electronics and hydraulics.

Fig. 15 illustrates a self contained, upward acting plastics compression molding press, produced by the Hydraulic Press Manufacturing Company of Mount Gilead, Ohio. Except for loading and unloading of molds, this press is fully automatic, and as with all HPM presses, is arranged for operation of semi-automatic molds equipped with knockouts. Compression molding requires that the mold be maintained at a temperature high enough to convert the molding material into a plastic state. In that condition, it is forced into the mold cavities.

Mold closing can be reduced, at any predetermined position, and, after slow down, closing may progress only as fast as the material softens. This adjustable, slow closing—or "easing in"—is especially advantageous when molding parts having delicate inserts.

The mold is held closed, under pressure, for a pre-determined "curing" interval although, in some cases, it may be opened during the curing cycle to permit escape of gases from the plasticized material. This automatic degassing or "breathing" is controllable at the discretion of the operator.

Fig. 16, we have a self contained electronic molding press in which, like the press described above, the mold is closed and clamped by the upward action of the platen. A center opening in the upper grid or bolster permits the operator to drop the molding material—which has been previously heated by high frequency—into the die sleeve or well. A downward acting plunger then forces the material into the mold, where it is cured under heat and pressure. Both the mold clamp and material plunger have independent speed and pressure controls, and this electronic press is universal in application in that it can also be used for conventional compression molding.

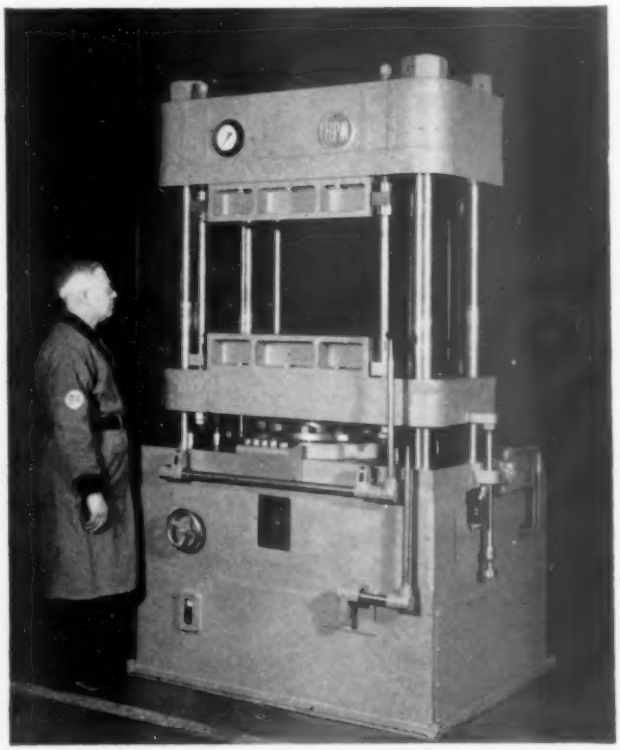
Injection Molding Principles

Injection molding consists of feeding a measured quantity of oiled, granular material into a chamber, where it is heated until of plastic consistency. A plunger then forces the plasticized material through a nozzle into the mold, which is tightly locked. The temperature of the mold must be low enough to permit cooling of the material so that it may be ejected without losing its molded shape.

The machine shown in Fig. 17 is designed for injection molding. This is a self contained, fully automatic injection molding press of 16 ounce capacity, and hydraulically actuated throughout, including the plunger for pressing the material through the nozzle and out of the mold. This machine, like the two previously described, is also a product of Hydraulic Press.

Of a somewhat different type, although hydraulically operated, is the Lester Injection Molding Machine shown in Fig. 18. Essentially, the procedure of molding by injection is as

FIG. 15. A self contained upward acting Plastics Compression Molding Press, a product of Hydraulic Press Manufacturing Company. Completely automatic.



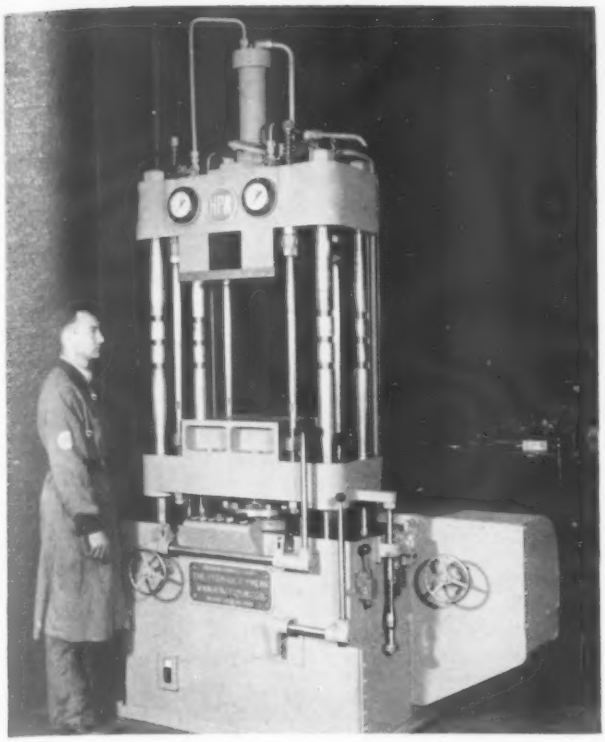


FIG. 16. **A self contained HPM Electronic molding press, universal in application. Induction heating of material puts this machine among the "Ultra-Moderns."**

described above; however, while this machine is hydraulically actuated, and fully automatic, it employs a toggle for closing and opening the molds.

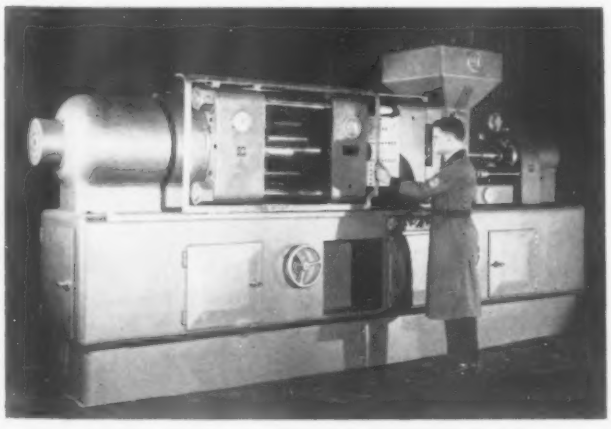
This toggle action is quite ingenious and—if one may use that term—operates on the "reaction" principle. Once the mold is closed, all of the great force created by the injection of the material into the mold is transmitted, through heavy toggle links, to the back plate of the machine. To maintain parallelism, as well as to withstand the heavy stresses, the machine is tied, top and bottom, with heavy cast steel beams. This construction replaces the tie bars ordinarily incorporated with hydraulic press design.

As previously stated, the toggles are used only for closing and opening the molds, hence, there is no appreciable load on the toggle pins once the mold is closed. The molds are accessible and easily interchanged, and may be quickly adjusted by a crank which, operating a worm and wheel, opens or closes the die space to the desired mold thickness.

In this machine, a sleeve type heating cylinder is used, thereby insuring uniform heating of the material from the moment it enters the cylinder until it is injected into the mold. The injection plunger is a precision fit in a water-cooled steel bushing.

Dual, automatic temperature controls—shown at right of machine—enable the operator to regulate the temperature of the material from the time it enters the heating cylinder until it is ejected from the mold. Once established, the temperature is automatically maintained without further attention. Another interesting feature is that the entire heating cylinder may be swung aside and away from the mold, thereby providing a clear opening to the rear of the mold for removal of sprues which may have broken away from the mold.

FIG. 17. **A fully automatic Plastic Injection Molding Press by HPM of 16 ounce capacity, it is impressive in its clean lines and rugged construction.**



Automatic Time Cycle

The complete cycle of this machine is controlled by three time clocks located on the operator's side, and contained in the control panel box at lower right of machine. These clocks can be set for any interval, and, once set, will maintain a steady cycle until changed. The hydraulic system is more or less conventional, but embodies all the features of good design found in the best of the hydraulically operated machines. This machine is the product of Lester-Phoenix, Inc., Cleveland, Ohio.

Among the new machines, a Transfer Molding Machine—(No. 152), product of Defiance Machine Works, Inc., of Defiance, Ohio, has unique features that fit admirably into the plastic scheme. This is a double acting, hydraulic press designed to operate from an accumulator system using pressures up to 3000 p.s.i. There are three platens, the lower or

FIG. 18. **Hydraulically operated and electrically controlled and timed injection molding machine by Lester-Phoenix, Inc. This machine operates on a unique "reaction" principle.**

main platen that moves upward, the intermediate or floating platen and the upper or stationary platen which is vertically adjustable in 2" increments.

This machine, shown in Fig. 19, is essentially designed for injection molding of thermosetting materials, and operates as follows: The mold charge is brought to a soft, plastic condition in a chamber which is built into the machine and separate from the mold. In this plastic condition, the material is then transferred or injected into the mold through a single opening. After the mold has been completely filled with the material, heat and pressure are applied and maintained for a period sufficient to completely cure or polymerize the molded part.

The transfer pot is centered in the floating platen and held in place when the upper half of the mold is attached to this

platen. After the pot is loaded, the lower platen—which mounts lower half of the mold—moves upward and closes the mold under low pressure. Contact of the mold faces then causes the floating platen to move upward until it is seated against the upper, stationary platen, when high pressure is applied.

The transfer cylinder (which moves while the piston is stationary) is mounted above the upper or stationary platen. An electrically heated plunger is attached to the lower end of the cylinder, and its downward movement forces the plunger into the pot, thereby compressing the pre-forms and making the transfer while the pressure of the lower platen cylinder holds the mold closed.

After curing, the push back cylinders—located beside the transfer cylinder—raise the plunger and break the sprue. The action of the push backs also starts the lower and intermediate platens downward, the latter being arrested in its descent, to allow the molds to open. The lower platen then continues to descend until arrested by the stops.

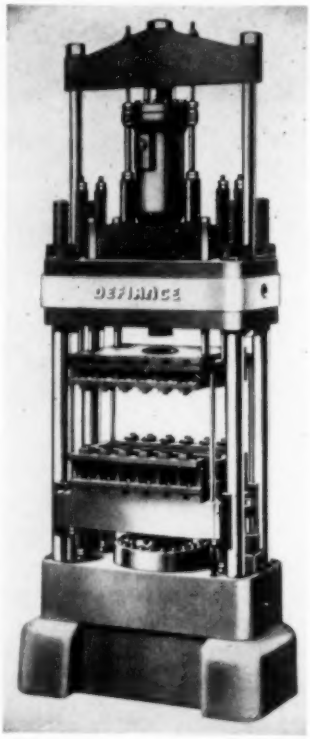


FIG. 19. **Double acting, hydraulic Plastic Transfer Molding Press built by Defiance Machine Works, Inc. Fully automatic, this machine is the "latest" by this manufacturer and operates on the booster principle.**

Description of the machines shown has naturally been somewhat concise, the whole designed for correlation with tools and materials rather than for detailed specifications. These are available, to anyone interested, from the makers.

5. Plastics-The Flow of Materials

*by Courtesy of Dr. E. J. Storfer**

BECAUSE direction of a plant, with all its inter-related departments, centers in Management, one naturally includes the executive offices—that is, the "Front"—in any plant design. Since, however, its functions are directive and administrative rather than productive and, on the whole, taken for granted, we will confine ourselves to the essential elements of plant layout and flow of material.

Flow of materials, and sequences of manufacture, are graphically shown in the accompanying diagram. In principle, this is similar to layouts for most lines of manufacture; there are, however, a number of deviations peculiar to the Plastics industry.

As is customary, raw material is delivered to Receiving, from where it passes to Testing or Storage, as the case may be. Usually, it passes through Testing—or, if you prefer, *receiving inspection*. There, it is tested for water content, quality and essential properties, as flow temperature, before being delivered to Storage. The material may also be subjected to experimental molding.

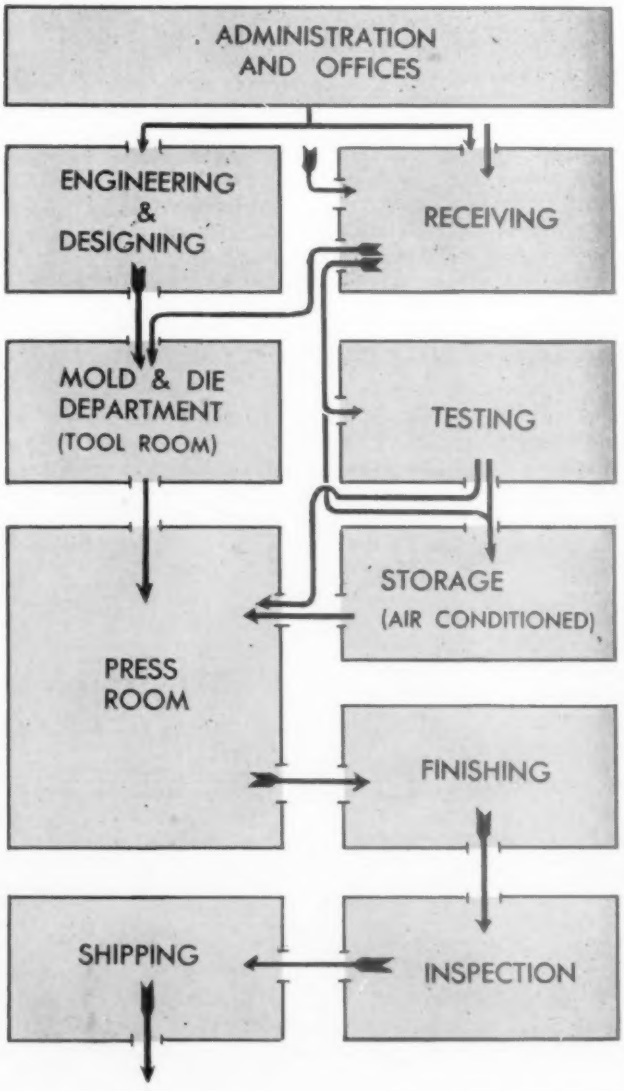
However, certain materials may by-pass Testing, going directly to Storage. This would hold where aging or conditioning may be required before processing, in which case testing would be deferred. Again, material may by-pass Storage, going directly from Testing to the Press Room, this implying the ideal state of flow through the plant. Storage is air conditioned for control of humidity and temperature.

Molding, and trimming of sprues and flashes, is done in the Press Room which, due to comparative "newness" of the Plastic industry, contains the most modern of equipment. From the Press Room, the product then goes to Finishing, where flashes are smoothed off and necessary machine work performed. The latter would include boring, turning, milling, drilling and tapping.

Provision for Machine Operations

For example, deep draws necessitate adequate draft, resulting in tapered holes or outside diameters, as the case may be. And, if either is to be straight, in the finished product, boring or turning would be necessary. This would also hold in the case of mating joints, which may have to be turned, milled or disc ground. Also, inserts may have to be machined—probably drilled and tapped.

If tumbling is required, this operation would precede machine work, as it would otherwise tend to cancel out precise machine finishes. Fine finishing, as polishing and buffing, is usually a final operation; however, the product may call for fitting and assembly, which is also done in the Finishing Department. From there, the product goes to Inspection, where it is tested for quality, tolerances and optical properties, as color, translucency and so on, and for uniform wall thickness. It is also checked, by means of vertical and horizontal screens, for distortion and markage. From there, the product goes to Shipping.



* Member, Plastics I. T. Institute.

In addition to product, there are the tools, which must be designed and fabricated. Therefore, two very important departments are Engineering and Tool Room. Engineering includes both product and mold design, both of which should be coordinated, as outlined in another section of this symposium.

After product and tool designs are checked and correlated, the mold designs are passed on to the Mold & Die Department—i.e., the Tool Room, where the molds are fabricated and tried out although, in most plants, try-out is done in the Press Room under actual production set-up conditions. The Tool Room also takes care of maintenance and reworking.

6. Plant Layout For Molding Plastics—

By Byron M. Hoover

THE object of plant layout is to expedite the flow of material from raw stock to shipping or to finished stores as the case may be. Hence, operation sequence must be carefully considered, so that parts in process may meet at a designated station, much after the manner of any well regulated traffic system. The system may be simple or complex, depending on the type of articles manufactured and whether or not they are units or assemblies.

Naturally, the available space and floor plan of a building will be a factor in layout. Where one can start from scratch and plan a building to suit, one can possibly achieve an ideal layout. But, should one work with a building already erected, one can only make the best of the situation, the while striving for an ideal. In this connection, one floor may be considered ideal, especially since the manufacture of plastic articles involves fairly heavy presses and equipment.

Space Influences Arrangement

Arrangement of molding press equipment and the type of equipment used depends a great deal upon the available space. The presses should be arranged in rows preferably running parallel to windows. They may be placed back to back for more economical piping layout. This arrangement permits two presses, particularly the semi-automatic type, to be operated by a single operator. The operator should be given the greatest possible amount of floor space around the press so that raw material can be supplied easily to the press and finished parts removed from it. At least six foot aisle space should be provided.

The accumulator and pipe layout are of great importance. They should be on the same floor level because greater efficiency is obtained from the line pressure and temperature. Neat pipe layout results in the conservation of space around press equipment. Piping systems can be arranged overhead, or they may be underground where concrete floor wells exist. In the latter case, pipes are located in an underground passage and grouped in a common aisle between two rows of presses. Considerable money can be saved this way because less expensive hangers may be used.

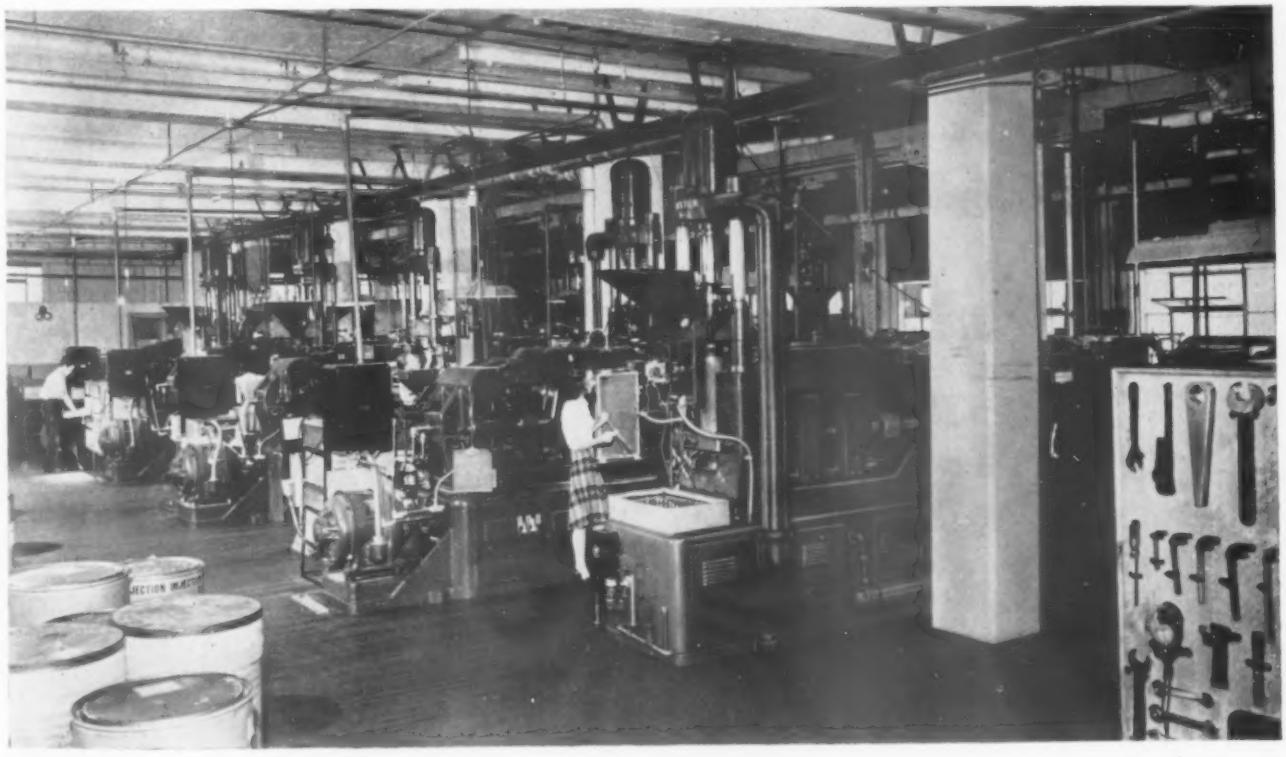
Color Identification for Piping

Inasmuch as piping systems are used to convey different products in the molding plant, a system of piping identification by colors should be adopted. Wall charts showing colors used should be prominently displayed. To insure free and uniform flow of heating media, straight line arrangement, free from sharp bends, should be used for steam piping. Main line pipes from the boiler should be large enough to provide the same steam pressure and heat to every press in the line. Pipes should be covered adequately to keep radiation to a minimum.

When the steam is turned on, even though it is not flowing, some water condensation will accumulate in the system. This is due to a transfer of heat to metal of the pipe, and subsequently to the air surrounding the pipe. This heated air rises, making way for cool air which causes steam to condense in the pipes. The piping system should contain no low spots or pockets in which water can collect.

The selection of adequate pipe sizes for a hydraulic system is very important. Sizes of pipes vary with the type of hydraulic pressure system. For a pressure of 2000 to 3000 lbs. per square inch on the line, and where the accumulator system is located a long distance from the presses, hydraulic pipe

A battery of Lester-Phoenix machines, as shown in Fig. 18 under heading "Machines." An excellent example of good plant layout and the efficiency made possible by good machines.



of ¾" to 1¼" double extra heavy should be used. Piping for low pressure systems should be of the standard extra heavy pipe type for a pressure up to 500 lbs. per square inch.

Standard weight pipe may be used for the hydraulic return or waste line, provided there are no obstructions which will permit high pressure build-up. These lines should be equipped with check valves or automatic bleeders, to prevent admission of high pressure water. Line pressure over 3000 lbs. per square inch is not recommended. It is better to keep hydraulic pressure around 2000 lbs. per square inch as lower pressure maintenance problems—leaks, or too frequent breakdown of the press ram gaskets and pump packings—will be much less.

Water Cooling Usually Needed

Although the general tendency is toward fast curing and hot pulled parts, water for cooling or chilling molds should be available. By cooling the mold close dimensions can be held, and the luster and surface of molded pieces can be improved. It is important to have a flexible air hose, equipped with a nozzle valve, placed within easy access of the operator. A blast of cold air is used to remove flash and pieces from the mold.

Branch lines from the air compressor tank should be supplied to supplementary equipment such as tumbling barrels, to blow dust from the pieces before they are polished. Air pressure should also be available at preforming tables to insure quick, thorough cleansing and reduce the possibility of contaminated material. An exhaust system at preforming machines is used for cleaning and dust removal. This system should connect with a dust collector.

Individual lighting in a molding plant should be arranged with flexible leads at each press so that the operator can have light reflected directly between the platens. This arrangement enables the operator to see misplaced inserts in the cavities, improperly located preforms, and, also flash sticking to the mold surface. This type of lighting is necessary even when general lighting of the plant is good. It is especially desirable during winter months and for night work.

Temperature of the molding room should be controlled within a comfortable range, and electric fans should be installed to remove the hot air. Where injection molding is practical, it is desirable to control the humidity of the molding room to a point at which mold temperatures are above the dew point. Also, space should be reserved for storage of molding material drums, and current supplies should be arranged so that they can be handled easily. This space should be kept dry and at a uniform temperature.

Space adjacent to the storage sections should be walled off for preforming and weighing. If several tabletting machines are being operated at once and several colors are being handled, it is desirable to build dust-proof stalls to prevent contamination of material. These dust-proof stalls should also be used in handling light-colored materials.

Molding plants should take special care of molds that are not in use. If proper storage space is not provided, molds become corroded and knockout gears and pins are misplaced. Space and racks should be provided for storage and molds and parts should be properly indexed so that they are easily located. Before storing, molds should be swabbed and coated with special acid free non-corrosive oil to prevent rapid corrosion of the mold surface and to eliminate the necessity of cleaning and polishing molds before they can be used again.

Finishing and Assembly Departments

The finishing department should be situated in a separate room. The same set-up that is used for light bench assembly work is usually satisfactory. Space must be provided for tumbling, finishing and polishing. In this same room other benches can be used for final inspection and packing.

Consumer manufacturers, as well as custom molding plants, use their general tool room for building dies used in plastic molding. But whether tools are made in the plant, or contracted out, it is highly desirable to have machine tools on hand for emergency repairs and maintenance. Also, there should be portable equipment with which to place molds in the presses and to remove them.

Summing up, proper plant layout is a matter of great importance. It is impossible to estimate the waste of time, and loss of money due to poorly considered plant layout. Proper layout increases worker satisfaction and directs more energy into productive effort.

It is important to the management because it tends toward control of quality, up to specified standards. It saves money, and reflects good management.

PLASTICS GROUP DISCUSSES TESTING EQUIPMENT

"*Equipment for Evaluating Rubber and Plastics*" was the central topic at a recent meeting of the Detroit Rubber and Plastics Group. The principal speakers were Dr. S. D. Gehman of Goodyear Tire & Rubber Company, Mr. B. G. Labbe, of the Government Laboratory, who substituted for Mr. J. W. Schade, and Dr. J. Liska, who represented the Firestone Tire & Rubber Company.

Dr. Gehman's talk dealt with basic research on synthetic rubber at the Goodyear Laboratory. He brought out that one of the most precise methods for determining the chemical structure of synthetic rubber is by infra-red absorption spectra, and, for this purpose, a large spectrometer had been built at Goodyear.

Infra-red spectra makes it possible, in synthetic rubber research, to distinguish between such closely related structures as the copolymers of butadiene with the three isomeric monochlorostyrenes. Also, structural differences in mass and emulsion polymers are readily shown.

One of the main difficulties in converting to manufacture of synthetic rubber has been its inferior processability—i.e., its properties of milling, calendering and extruding with rubber processing machinery. Simple plasticity measurement does not suffice for process evaluation, and usually, milling or extrusion tests, involving flow measurement and the qualitative observation of the smoothness, tearing, swelling or shrinking of the sample, are necessary.

Mr. Labbe reported on the Government Evaluation Laboratory at Akron, Ohio, which covers a pilot plant, the evaluation laboratory, the mechanical building and a dryer house. While well equipped with modern rubber working machinery, the primary object of this laboratory is evaluation, hence, the physical testing lab is of prime importance. This laboratory is air conditioned and equipped with the most modern of testing devices, including all types of tensile testers for room as well as elevated temperature.

Dr. Liska's talk covered dynamic tests of rubber-like materials; stress relaxation; X-Ray diffraction; the electron microscope and low temperature bending modulus.

The need for knowledge regarding the behavior of these materials under dynamic conditions became apparent with the years, and as a result, there has been considerable development in many types of machines for dynamic testing, as, for example, the Goodyear and Firestone resonance vibrator units. The one subjects the samples to compressive tests, the latter to shear.

By **Karl Stad**

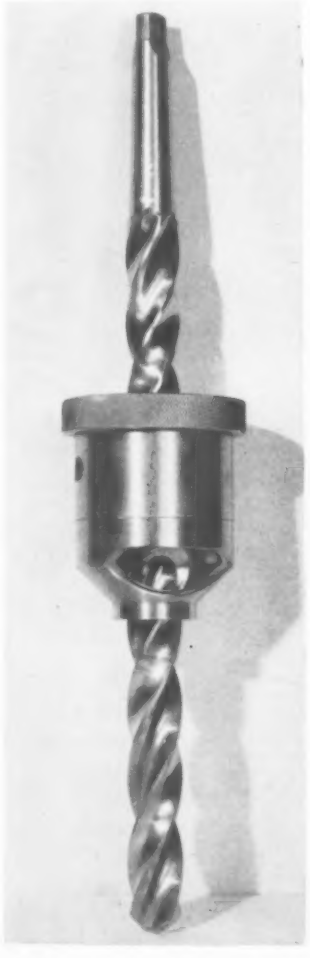
Speed And Precision With Hyper Drilling

Revolutionary technique portends speeds in mass production drilling far beyond present practices.

A NEW system of drilling, recently developed at Detroit Reamer & Tool Company under direction of its president, R. W. Andreason, has portent of a major advance in the techniques of mass production. In this connection, the term system is used advisedly. This is because several factors are involved, each necessary to the success of the method. When so combined, holes may be drilled at incredible speed in steel, cast iron or non-ferrous metals.

Before going into performance details, however, a brief resume of more conventional drilling methods may be in order for a clear picture of the new system, of which the component units are shown in assembly below, and which, essentially, is a mass production tool.

Taking an 11/32″ conventional drill as a standard of comparison, the average recommended speed, for mild steel, is around 1350—or, roughly 120 ft. per minute. Recommended feed is .007″, which would give 9 inches per minute—if such a rate could be sustained. Practically, it can't, at least not if drilling to any depth. For ordinary cast iron, not annealed, the recommended speed is about 900 R.P.M., or 80 ft. per minute, with a feed of .007″. That would give about 6.3 inches per minute, also assuming that this rate could be maintained.



The two main units—special drill and special rotary bushing—as combined for hyper drilling.

Higher Drill Speeds—Continuous Feed

With the hyper-drilling system under discussion an 11/32″ drill, running at 1800, went through a cast iron block, 6¼″ thick, in 22 seconds. A second hole was drilled, also through the block, in just short of 15 seconds—and even that wasn't top performance! Taking an average between these, however, that would be at a rate of about 20 inches per minute, with more possible. Not bad! In high carbon steel, drilling through a 4″ block, the rate was about 4″ per minute.

In a test run on a No. 4 Warner & Swazey turret lathe, a 1.040″ drill, running 640 R.P.M., with feed rate of .006″, drilled into hot rolled steel, having .35-.38 Carbon, .65-.80 Mn and .90-1.10 Chrome, at a rate of 3.84 inches per minute. And that was not considered maximum performance

One reason for the high drilling speeds attained is that, in each test, the drill went through without stopping or retracting to clear the chips, as is ordinarily done in deep hole drilling. The drills used were of high speed steel (nothing "souped up"), heat treated and hardened to standard specifications, yet, they have shown remarkable life under extreme conditions. From all this, then, one may infer that the system portends a revolution in mass production drilling techniques.

The hyper drilling system described in this article has been developed, at Detroit Reamer & Tool Company, Detroit, Michigan, under direction of *R. W. Andreason*, president.

In considering the "how" of the new system it is again advisable to compare the new with the old. In this connection, the reader is assumed to be familiar with conventional oil hole drills, such as are used to direct coolant to the cutting lips of the drill. As ordinarily manufactured, these are roughed or forged with the flutes straight. The holes are then drilled, after which the flutes are twisted to the desired helix and finish machined.

This method of manufacture has its limitations. For one thing, the size of the holes and therefore their coolant capacity is limited by the amount of solid metal between grooves, and for another, the drilled holes may deviate from a straight line. As a result, they may come too close to the cutting edge as the drills are recurrently sharpened. Besides, the method is slow, considering that comparatively small drills must be used for deep hole drilling of the coolant holes in the flutes.

Ducts Provide Greater Coolant Flow

As an improvement, Detroit Reamer & Tool Company developed the milled oil channel, which is then sealed with a silver-soldered strip of mild steel. By this method, the coolant duct follows the helix of the flutes, with constant wall thickness; besides, the area of the duct is considerably increased without in any way impairing the cutting edges of the drill or reducing its strength.

See Fig. 1 for comparison of (A) conventional drilled, and (B) the improved, milled coolant ducts. This comparison is shown because, with modifications, the milled coolant duct is an essential element of the new technique. The photographs, Figs. 2 and 3, show these milled and sealed ducts on conventional 2-lip and subland-drills, as do Figs. 4 and 5.

Here, an aside about subland drills—or, as they are sometimes called, multicut drills. Essentially, these are two drills in one, each diameter or step having separate cutting lips and flutes which permit sharpening either without disturbing the

other. Incidentally, the design permits of ready disposal of chips. As an added note, any of the drills described may be had with the lands circular ground—i.e., without relief—or backed off. The former have the advantage of holding size longer than the relieved.

Hyper Drilling System Includes the Workpiece

The hyper-drilling system consists of several units—the drill itself, a special bushing, a high pressure coolant system and, what is rather unusual, the workpiece itself.

The drills used are of the milled duct type, as described

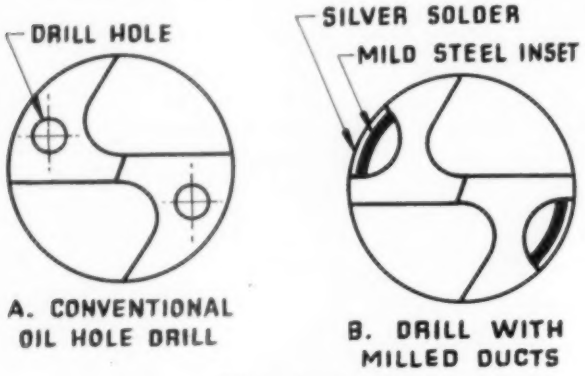


FIG. 1—A and B.

FIG. 2

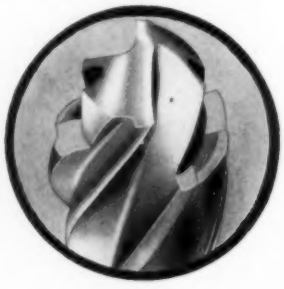


FIG. 3

Two lip and subland drills with milled and sealed coolant ducts.

above, with the difference that the channels are open. Superficially, they look like conventional 4-flute drills with two alternate or intermediate flutes serving as coolant ducts. These flutes have a uniform radius, with a nominal land between them and the major flutes. The relationship between intermediate and major flutes must be closely held, for reasons to be explained later.

FIG. 4. **Straight shank, two lip drill with milled and sealed coolant ducts.**

FIG. 5. **Taper shank, sub land drill with milled and sealed coolant ducts.**

The drills are longer than ordinary, due first to the fact that they are driven from the flutes, rather than from the tang, as in the case of taper shank drills. This method of driving is necessary because the tang would be inadequate to withstand the considerably higher torque of hyper drilling. Extra length is also necessary because of the special bushing, which is considerably longer than conventional types. A typical drill for this system is shown in Fig. 6.

It will be seen, from the photograph, that the coolant channels are very wide and of considerable depth, yet, the radii are so disposed in relation to the cutting flutes that there is no appreciable lack of strength on the latter.

FIG. 6. **Typical drill for hyper-drilling system.**

The bushing—Fig. 7—is a specially designed, rotary type running in precision ball bearings in a stationary housing. This bushing serves a severalfold purpose. Its inner revolving shell is provided with a baffle, located just below its upper end which, in turn, is slightly below the head of the outer shell. This baffle has four slots, coinciding with the lands of the drill. See Fig. 8.

FIG. 7. **The bushing. Note opening for chip disposal, outer shell, and chip cutters in inner shell.**

Immediately below the baffles are two seals—also shown in Fig. 8—of resistant, synthetic rubber. These are inset, in cavities, at an angle corresponding to the helix angle of the drill. Below these, in turn, but in the same cavities, are the outlets for the coolant, which enters, under high pressure, through a groove and drilled holes from the side of the outer shell of the bushing.

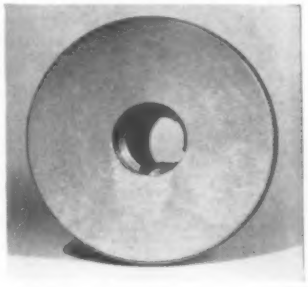


FIG. 8. **Showing the flute guides and Neoprene coolant seals.**

The lower end of the inner shell is cut away, on a spiral coinciding with the flute helix, to form two sharp cutting edges. These break the chips as they are forced, curled, from the cut. The solid portions of the inner shell, between the cutters, serve as walls to seal the coolant ducts. See Figs. 9 and 10. Spirals, drawn from the four slots in the baffle to the end of the inner shell, would coincide with the chip breakers and the solid, intervening walls.

The outer shell, which terminates in a sharply reduced diameter, extends slightly below the inner, with its inside diameter a few thousandths larger than the I.D. of the inner shell. This is to prevent the drill from rubbing on the stationary shell. Theoretically, the small end of the outer shell bears directly against the work, but practically, there is a slight clearance to allow for the higher limits of tolerance of the workpiece. The conical section, as will be seen by referring to Fig. 7, is cut away on two sides for chip disposal.

Chips Forced Out by High Pressure Coolant

In entering the drill into the bushing, as shown in Fig. 8, the four slots in the baffle act as guides and insure the proper relation of the major flutes to the chip breakers, and of the intermediates to the solid portions. Hence, the necessary close relationship of the flutes. The intermediate flutes are then closed by the rubber seals, as a result of which the coolant is diverted downward and along the intermediate flutes or ducts to the point of the drill. Coming through under high pressure, and in considerable volume, it then forces the chips upward through the major flutes until cleared. This action, which is shown in Fig. 10, is constant during the cutting pass of the drill.

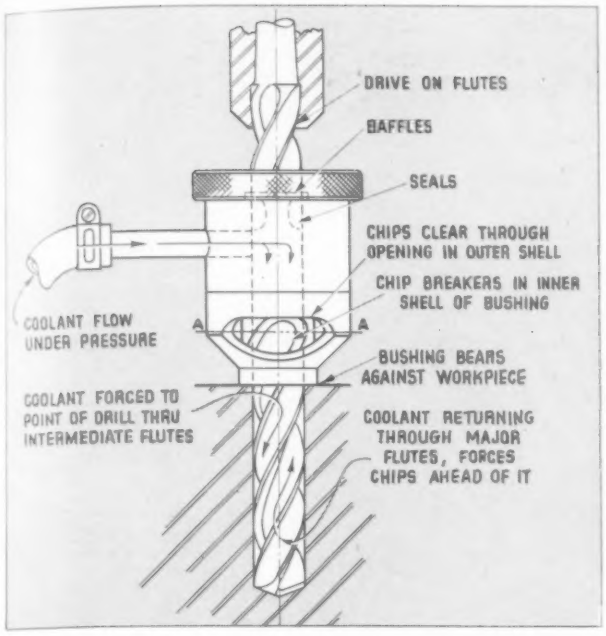

DRIVE ON FLUTES
BAFFLES
SEALS
CHIPS CLEAR THROUGH OPENING IN OUTER SHELL
CHIP BREAKERS IN INNER SHELL OF BUSHING
COOLANT FLOW UNDER PRESSURE
A
A
BUSHING BEARS AGAINST WORKPIECE
COOLANT FORCED TO POINT OF DRILL THRU INTERMEDIATE FLUTES
COOLANT RETURNING THROUGH MAJOR FLUTES, FORCES CHIPS AHEAD OF IT

FIG. 9. Section through bushing, showing relationship of flutes to chip cutters.

One item, apparently overlooked, is the fixture. Naturally, a work holding fixture is assumed, and this can be of any type or design, including a pump jig, suited to the workpiece. Preferably, it should be clamped or secured to the drill table. In designing the bushing plate, however, provision must be made for clamping the bushing, also for a tapped inlet for the coolant pipe. A high pressure coolant system must also be included.

A question may arise regarding a possible clearance between the nose of the bushing and the workpiece, especially if the latter has a rough or unfinished top surface. In the case of a finished surface, with usual tolerance, a few thousandths clearance, with its incidental leakage, might not materially affect coolant pressure. However, it would be very easy to install a Neoprene seal ring or gasket between the bushing and the workpiece; this, being flexible, would seal the joint without interfering with clamping.

Summing up, and correlating the various elements, we have:

(1) a special, tang driven, 4-flute drill, of which two flutes serve as coolant ducts, and (2), a bushing which acts as a seal for the coolant, as a seal between itself and the workpiece, and which also acts as a chip breaker and chip disposer in addition to being a guide for the drill. The whole provides for faster drilling because of the superior cooling afforded by large area ducts, in addition to chip removal under high presure.

As outlined above, the method may seem somewhat involved, and undeniably it is involved when compared to conventional methods of drilling. Actually, however, it is rather simple, especially when it is considered that the system is designed for mass production, not for short run jobs. Once set up for production, it shows remarkable results.

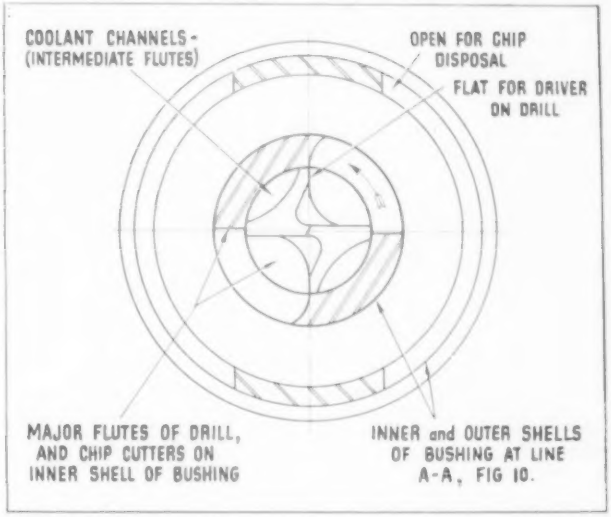

COOLANT CHANNELS - (INTERMEDIATE FLUTES)
OPEN FOR CHIP DISPOSAL
FLAT FOR DRIVER ON DRILL
MAJOR FLUTES OF DRILL, AND CHIP CUTTERS ON INNER SHELL OF BUSHING
INNER and OUTER SHELLS OF BUSHING AT LINE A-A, FIG 10.

FIG. 10. The hyper drilling system in assembly. Note coolant flow, sealed from entry to exit.

Rotary, Ball Bearing Bushings Extend Tool Life

The rotary ball bearing bushing is accurate to begin with and remains accurate indefinitely. The bushing tends to center the drill and, since both bushing and drill turn together, there is no rubbing wear except for the comparatively slow, lengthwise feed of the drill between the drill O.D. and the bore of the bushing. Tool life is further extended because the lands of the drill are circular ground, resulting in larger contact areas, and more regrindings without loss of size.

Proof of the advantages of this new drilling system is in its performance. And here, first impressions on the part of an observer seem to be entirely confirmed. There is no remarkable fuss as the drill literally plunges through metal, but 20 inches or more per minute in cast iron, with an 11/32" drill, is speed!

Dimensional Stability of Steel

Subatmospheric transformation of retained austenite, is Part 1 of a study—The Dimensional Stability of Steel—sponsored by The Sheffield Foundation, Dayton, Ohio. This is an abstract of a paper presented before the 26th Annual Convention of the Society of Metals, by Stewart G. Fletcher and Morris Cohen, respectively research associate and associate professor of physical metallurgy, Massachusetts Institute of Technology.

Because of the general usage of low temperatures for dimensional stabilization of heat treated gage steels, it becomes essential to obtain a more precise picture of the subatmospheric decomposition of retained austenite than is available at the present time. In this paper, a combined X-ray and dilatometric procedure is described for making a quantitative study of subcooling transformations. Detailed charts are given to show the extent of austenite decomposition as a function of subatmospheric temperature and time of prior aging at room temperature. Room temperature aging lowers the temperature at which the retained austenite starts to transform and reduces the amount of decomposition attained by cooling to any selected temperature. However, the cooling transformation continues down to -250 to 260 degrees Fahr. (-155 to 160 degrees Cent.), irrespective of the aging treatment.

Copies of the paper may be had from The Sheffield Foundation which, sponsored by The Sheffield Corporation and the general public, was established for the promotion of educational, scientific, religious and charitable activities.

By George E. Platzer

Machine Parts and Bearings Fabricated

Less machining, closer limits, release of critical machine tools and lower production costs are among advantages of modern powder metallurgy.

Research in powder metallurgy was started by the Chrysler Corporation in the mid-twenties. From that time on, the Amplex Division has been dedicated to a comprehensive research program pointing to the improvement of self-lubricating bearings, lubricants, and the fabrication of a wide range of structural parts. Continued research has resulted in the development of many products under the trade name *Oilite*.

While the war created many problems and effected numerous changes, the years of research, coupled with the backlog of experience and knowledge gained in peacetime, permitted a quick conversion from the manufacture of consumer goods to the many new and different products for war.

George E. Platzer, **Chief Engineer of Amplex Division of Chrysler Corporation, was graduated from the Pratt Institute as electrical engineer in 1913. After a number of years with General Electric and Sterling Electric Motor Companies, he joined Amplex in 1937. He has specialized in the application of powdered metal bearings and machine parts.**

The first powdered metal product manufactured by Chrysler was a heavy duty, general purpose, oil cushion, self-lubricating bronze bearing for the clutch pilot of an automobile engine. This proved so efficient that applications were broadened, with the result that Oilite became immediately popular for such equipment as automobiles, airplanes, farm and textile machinery, railroad equipment, engines, motors and household appliances—in fact, in virtually every field where wheels turn. And as a result of ever widening demand, we are now in production on Oilite bronze bearings as large as 18″ diameter and nearly 100 pounds in weight. We do not consider size as a limiting factor, being guided entirely by the economics involved.

Oilite Bearings are made from thoroughly mixed metal powders having an average mesh or screen size of about 250. This mixed powder is fed into a briquetting die, having a well depth of approximately three times the length of the finished product. In other words, a 3″ long cylinder of loosely deposited powder is required to make a briquette 1″ long. The powder is fed in by a hollow shoe, then an upper punch compresses the column to a given length. A lower punch ejects the briquette and the shoe sweeps it away and refills the die, repeating the operation.

Comparable to the Making of Bread

Briquetting is followed by sintering, which is a heat treating operation so termed because the melting point of only one of the metal constituents is reached in the process. Therefore, the briquette never loses its original shape. In making Oilite Bronze Bearings, we reach the melting point of tin, but not that of copper; thus the bearing or part retains its original shape.

The entire manufacturing procedure may be compared to making bread, as the screening or sifting of flour, mixing or blending the materials and shaping and baking.

The sintered bearing is then immersed in oil for a few minutes, then sized in dies to final dimensions and tolerances. We allow .001″ tolerance on the I.D. and O.D. for small bearings up to 1½″ in diameter; however, more liberal tolerances are necessary on large sizes. The same general practice is followed in the fabrication of machine parts.

Load Capacities Increased

The final step is oil impregnation, whereby the porous structure of the bearing absorbs a full complement of oil. In many cases, this is sufficient for the life of the bearing. In effect, then, Oilite is a metallic sponge, containing about 30 per cent of oil by volume, from which it might appear that the porous structure of the bearing would be weak as compared with cast metals. Actually, however, the Oilite Bearing operates under the principle of hydraulics; thus, the oil contained within the bearing provides added strength, which is particularly advantageous in applications where shock or impact loads are encountered.

One of the subsequent projects undertaken by our research engineers was that of making a bearing with an even greater load carrying capacity than Oilite Bronze. This, also a self-lubricating oil cushion bearing, was developed and called Super-Oilite, the major constituent of which is powdered iron. Super-Oilite has a static load capacity of 35,000 pounds per square inch. We then successfully developed an extreme pressure non-corrosive type lubricant having 30,000 pounds film strength for this new bearing material.

Saves Material and Equipment

Many problems were involved in early fabrication, including the necessity of importing powdered iron from Europe and the establishment of proper powder specifications. Fortunately, American producers were interested in the production of powdered iron, and by the time we entered the war, were able to supply our increasing needs.

The rapid acceptance and popularity of Oilite products is due to the innumerable advantages produced by powder metallurgy. For instance, there are a great many cases where machine parts can be fabricated from powdered metals with mechanical and physical advantages unobtainable from standard practices. Powder metallurgy gives the tool engineer a new product, often at a considerable saving in cost through the elimination of machining operations and the saving of *essential equipment*.

Another advantage, particularly striking in the war period, is that parts may be tooled up for fabrication from powdered metals in a matter of days, as contrasted to months by other methods.

Take, for example, steel hubs and other parts, with external and internal splines. With tooling and all, we were in production in six weeks, as contrasted with eleven month delivery on broaches alone. As another example, we produced anti-aircraft gun sight supports in a matter of seconds as compared to a previous machining time of two hours. In many cases, self-lubricating qualities, obtainable only in the powdered metal arts, added advantages entirely aside from the initial lower cost of fabrication.

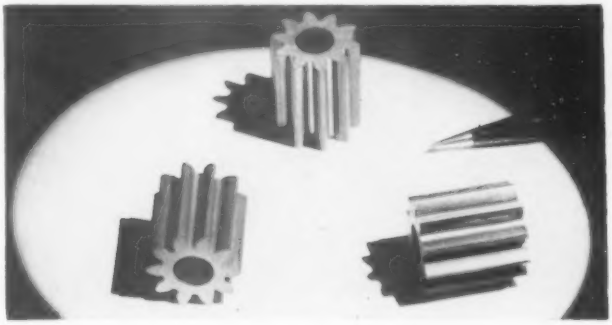
From Powdered Metals

Resume of a paper presented before Racine Chapter, A.S.T.E.

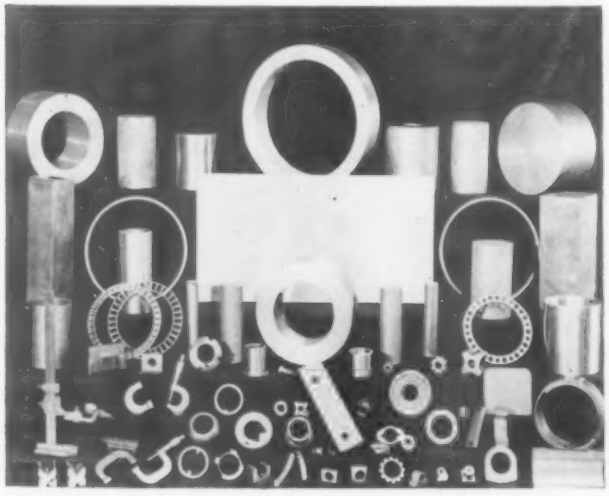
The comparative newness of powder metallurgy makes painstaking scientific and technical research a vital adjunct to its development. Above President A. J. Langhammer of Chrysler Corporation Amplex Division examines a sample of metal powder. Note the large plate and other objects made from metal powders.

Typical of the versatility of powdered metals are these Oilite filters, used for filtering, venting, mixing, separating, metering, diffusing and flame arresting. These filters are not only finding wide use in various industries, but are finding ready acceptance in research and experimental laboratories.

Employing powdered metal techniques, the powder, at right, is transformed into the shining gun part, at left, in 22 seconds, the time being exclusive of sintering. In addition, the part is self-lubricating, a unique feature of this process of manufacture.



Gears, from small pinion rod size up, are made directly from powdered metals in a matter of seconds, and require no further machining except a possible "fitting" grind on the ends. The gears shown (compare with pencil) are for automobile application.



A typical cross section of powdered metal bearings and miscellaneous parts, manufactured by Chrysler-Amplex. Some bearings are porous, some dense, some dry and some self-lubricating. These units are said to be made up to 200 times faster than with other methods, with features not obtained by usual machining methods.

Typical machine parts, ranging through gages and gage bars, showing collars, ball and roller bearing cages, Vee blocks, splined hubs and so on ad infinitum, made from powdered metals. Once out of the dies—and forming is a matter of seconds—they are usually ready for use without further machining.

At one time there were many items, considered impossible to fabricate from powdered metals, which today are in regular production. As an example, we have a pump set, consisting of an outer and inner rotor of Super-Oilite. No machining operations are required on the rotors, except that of facing. The pump is more efficient and powerful than the gear pump formerly used, and the cost is considerably less. It is not unusual, in powdered metal technique, to provide a 50 per cent saving in price with equal or improved performance.

Powder Metallurgy Offers Many Advantages

Machine parts fabricated from powdered metals have definite advantages, as follows:

1. Uniformity
2. Low part cost
3. Low tooling cost
4. Chemical purity of metal or alloy
5. Elimination of machining operations and equipment
6. Close tolerances and smooth surfaces
7. Freedom from blow holes, cracks, etc.
8. Short tool-up period
9. Self-lubricating bearing surfaces where required
10. Broader scope for Designing Engineers

Powdered metal parts provide performance surprises, and sometimes thrills. For example, we were asked to make a thrust bearing to replace a hardened and lapped plate on an important war item. This part has to take an instantaneous thrust load of approximately 100,000 pounds. The hardened and lapped plate had a life of six hours on the destruction test stand. The Oilite Thrust Washer has a life of thirty hours, or five times greater.

Another interesting case history is on air motors for lapping hardened valve seats. These motors operate at approximately 20,000 to 30,000 RPM. The Maintenance Department had a difficult time keeping these motors in service, due to failure of anti-friction bearings. Oilite Bearings were installed and their bearing difficulties were overcome. Among other unusual parts where production bottlenecks were broken are micrometer frames, made from powdered iron, and toolmakers V blocks, the latter having a hardness of Rockwell 60 C.

We do not confine our activities to bronze and iron base materials alone, but also employ such alloys as brass, aluminum, copper, etc. As an example, we furnish millions of brass parts of irregular shapes that formerly had to be machined. Machining operations were eliminated at great economy, including the conservation of strategic materials.

Oilite Bronze can also be furnished in sheets. These are made in a range of .015″ to .080″ in thickness, or even greater. In many cases we bond these sheets to steel plates or steel bars to provide self-lubricating surfaces for gibs. Also fabricated are magnetic chuck blocks, using alternate layers of sheet Oilite and steel which are then bonded together.

Ideal for Many Filter Types

As other examples, there are Oilite Bronze filters which are furnished either in sheet form or as fabricated parts. These filters provide the engineer with a wide variety of shapes for screening, filtering, diffusing, metering, mixing, venting, flame arresting and similar functions. In addition, powdered metal filters offer a new and important product because they do a filtering job better than anything heretofore developed. One of the main features is the tortuous passages through which liquid or gas must flow in the powdered metal filter as against a more or less straight path in conventional screen filters. The size range varies from small tubes ¼″ in diameter up to large cylinders and plates with a filtering or metering area measured in square feet.

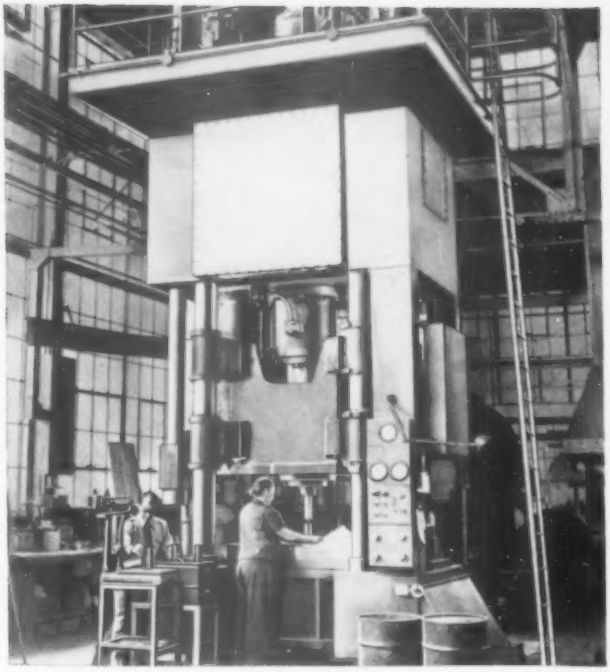
Today, we have dies for more than 16,000 items in sizes ranging from tiny, oil impregnated rivets, weighing 10,000 to the pound, to giant Oilite Bearings approaching a weight of 100 pounds each. In addition to the Amplex research staff and engineering department, we have the cooperation of the large modern Chrysler Engineering Laboratories and their staffs. Some items may not be discussed at this time, but we can assure you that progress and development in powder metallurgy is continuing at a rapid pace.

Powdered metallurgy also offers a full line of cored and bar stock. These self-lubricating bearing materials are made in Oilite Bronze, Super-Oilite and Iron Oilite. This line of cored and bar stock has met with increasing popularity, due

Briquetting press, where powdered metals are transformed into parts at a stroke of the rams. The metal powder flows through the tubes (shown) and is automatically fed and metered into the die.

Close-up of table of a briquetting press, with a bushing being ejected from the die. Both upper and lower punches operate, the lower acting as ejector. The next step is sintering.

A batch of Oilite Flange bearings coming out of the oil bath. These bearings are a metallic sponge, about 30% porous, with oil retained by capillary attraction which insures a long self-lubricating life.



One of the huge, modern, hydraulic presses, especially designed for manufacture of the larger bushings and machine parts.

to its importance in the war program and potential place in our post-war industry.

Actually, this material has three important uses. First, as a replacement for bearing breakdowns on important machinery. The self-lubricating, cored and solid bars are easy to machine and can provide a plant with a quick bearing replacement. The second feature is in bearing maintenance, where the cored and bar stock can be used to eliminate a possible faulty bearing installation.

The third major use of this popular line is in experimental work where a self-lubricating bearing of a definite size is often needed in a hurry. Plants all over the country now keep a stock of these bars for ready machining when breakdown or faulty installation requires quick replacement. Bearings machined from Oilite cored and bar stock are permanent replacements—not something to tide over until a bearing of the proper size can be secured.

The uses of these bearings, then, are wide and varied, while powdered metals lend themselves to an infinite range of applications in structural parts and—of particular interest in the field of mass production—to tools. They have become an integral part of our national manufacturing economy.

Shortwave Radio Key to Postwar Progress

Greatly expanded postwar activities in shortwave radio—and especially in frequency modulation, high frequency heating for industrial processing, television and international communications—are forecast by Walter Evans, vice president in charge of radio, radar and electronics development at Westinghouse Electric Corporation, Baltimore. And here, the greatest single contributory factor will be the vastly increased "Know-How" acquired during the industry's record war production.

In gist, Mr. Evans explained that: "World War II is a great mechanized conflict, but . . . it has become a war of electronics as well. Practically every phase—material tests, quality control, manufacture, communication, radio, radar and medical and surgical safeguards—depends upon electronic applications.

"We have made great progress in all of these fields and, since nearly all depend upon operation in the shortwave spetrum, one can easily see how lessons learned during the war give promise of rapid and, perhaps, spectacular progress after the war."

This forecast came on *shortwave's* twenty-first anniversary, for, although known years earlier, it was not until June 24th, 1924, that it won general acceptance among world radio authorities. With regard to postwar uses, Mr. Evans continued: "Without shortwave we would have no radar . . . no static free FM radio, no television, no low-power long distance communication and no dielectric heating which . . . serves other military and civilian uses. Known before the war . . . it remained for war's urgency to hasten their refinement and broaden their applications. Advances of two decades have been packed into six years of war . . . and as a result V-J Day will find us with an almost inexhaustable electronics "know-how" waiting to be harnessed to peacetime tasks."

Mr. Evans further pointed out that electronics will not only bring on devices for better living but, by widespread employment, greater purchasing power to afford and enjoy them. More, shortwave is destined to play an increasingly important role in world affairs, after victory, with international shortwave stations fostering mutual good will and understanding between nations.

Electronics further portend new tools for industry. High frequency heating, the newest contribution to better-quality-at-lower-cost manufacture on the part of electronics science, will also reflect war developments in postwar applications.

"Already used to bond plywood, to cure plastics and dry nylon yarn, this newest tool of industry will find numberless new opportunities to improve postwar production and reduce costs. Also benefiting—will be induction heating, which is not dependent on ultra-high frequency operation."

THE *Fundamentals* OF TOOL ENGINEERING

The Elements of Wire Drawing

No. 4 of a Series.

SINCE extrusion and swaging, previously discussed, shape metals by deformation and without appreciable waste of material, the *Elements of Wire Drawing* follows as a natural corollary. For drawing, too, shapes by deforming and, because either or both of the foregoing processes may be employed as preliminary operations in wire drawing, there is a definite relationship.

The first wire was presumably drawn by hand through crude dies, not so difficult if the reduction isn't too great. Before drawing, however, it had to be reduced to a near size, an operation doubtless performed by hand swaging, previously described. A later step was the draw bench, which employed leverage—as a capstan—for the necessary pull.

These earlier devices and methods were slow and limited in scope, yet, embodied all of the essential principles of modern wire drawing equipment. The first crude draw bench, for example, evolved into the highly refined, modern draw bench illustrated in Fig. 1. These machines are one-man automatic, used for bar reduction and of capacities ranging

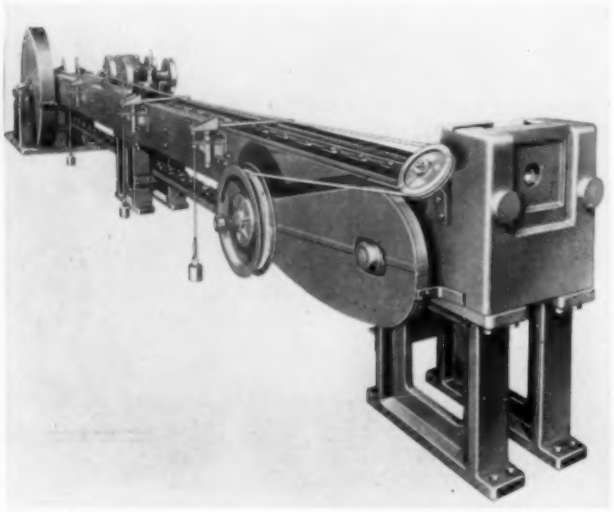


FIG. 1. Modern Draw Bench, for manufacture of rod. Photo by courtesy of Standard Machinery Company, Providence, R. I.

from 1,200 to 50,000 or more lbs. pull. The rod is gripped by toggle tongs, which open and close automatically and which are automatically returned to the head at the end of the draw cycle. These machines are not used for continuous drawing, but for drawing rods to specified lengths.

Electrical Age Accelerates Progress

Comparatively little progress was noted, in the art, until the electrical age forced the manufacture of wire on a varied and colossal mass production scale. The first really big demand came with the invention of telegraphy and the subsequent laying of the first Atlantic cable.

While we are mainly concerned, here, with the manufacture of round wire, it can be drawn or rolled (preferably rolled) into irregular sections, as square, rectangular, polygon, half round and so on through an infinite range of shapes. A modern machine for such manufacture, and known as the Turks Head, is shown in Fig. 2. This machine comprises two units, the first primarily used for breakdown, the second for finishing and sizing, although it performs some additional reduction. Both of these machines are the product of Standard Machinery Company, Providence, R. I.

In the manufacture of wire, the material comes to the machine in the form of rods, preferably of a size nearest over

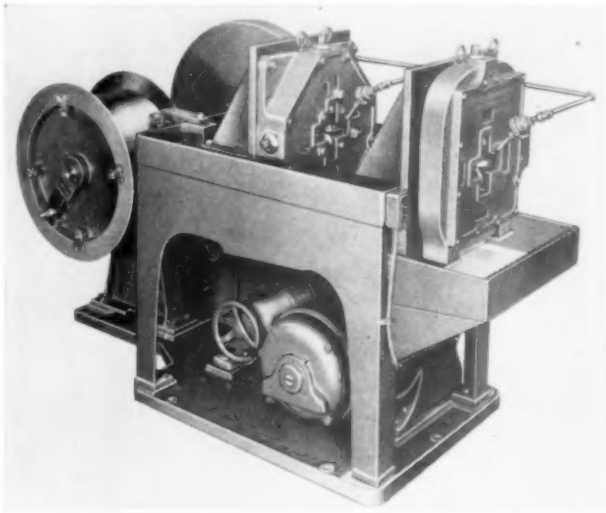


FIG. 2. Turks Head Machine, for manufacture of Odd Shapes. Photo by courtesy of Standard Machinery Company, Providence, R. I.

that of the first reduction. This is then reduced, as by swaging, for a distance sufficient for threading into the die, when it is gripped by a clamp or tong and drawn to a length that will permit wrapping around a pull-through sheave. This preliminary step is shown in Fig. 3.

Wire drawing machines may be made for single or double reduction, as of the types used in the jewelry trades and in

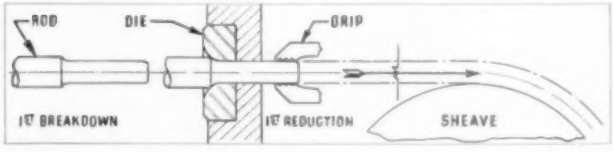


FIG. 3. After breakdown, wire is threaded through die and wrapped around pull-through.

the final reduction of ultra-fine wire. For mass production of intermediate and heavier wire, however, the wire is drawn through successive dies, as in Fig. 4. Each step, in reduction, may be considered a separate unit since each pull-through sheave is timed, in its rotation, to the progressive reduction of the wire. This is obvious since, with each reduction, the next succeeding draw flows through the die faster than the preceding. Volume being the same, flow is naturally accelerated.

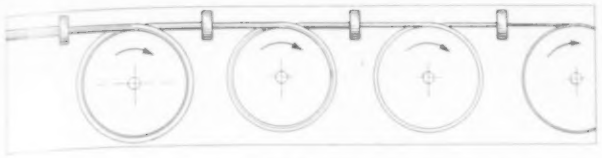


FIG. 4. Flow is accelerated through successive dies, to compensate for area reduction.

While copper and similar non-ferrous wire can be reduced more sharply between steps, iron and steel wire is best reduced by progressive steps that correspond to one number in the gage used. These numbers proceed in geometrical ratio or progression. In the Brown & Sharpe gage, for example, the basic size is No. 36, which is .005″ diameter.

Reduction Is By Geometrical Progression

The ratio of geometrical progression is 1.123 which, multiplied by its predecessor, gives the next larger size. For example, .005″ × 1.123 is .0056″—or No. 35—which, again multiplied by the constant, gives .0063″, or No. 34, and so on up to the maximum size of the gage. This progressive reduction is illustrated in Fig. 5.

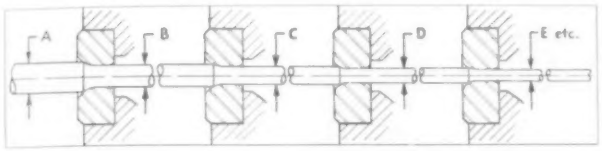


FIG. 5. Steps A, B, C., etc., correspond to scale of gage used.

The dies used for the medium and larger sizes of iron and steel wire are draw plates made from tungsten steel, but finer sizes, as below .0049″, are drawn through diamond dies. The coarser copper wires are reduced in chilled iron dies, with the small sizes drawn through diamond dies, as in the case of steel and iron. Latterly, diamond dies—and, for that matter, chilled iron and even tungsten steel—are being superseded by dies of sintered carbide, of the type illustrated in Fig. 6. These dies show wearing qualities quite superior to the chilled iron or tungsten steel, and, cost considered, may be favorably compared with diamond dies.

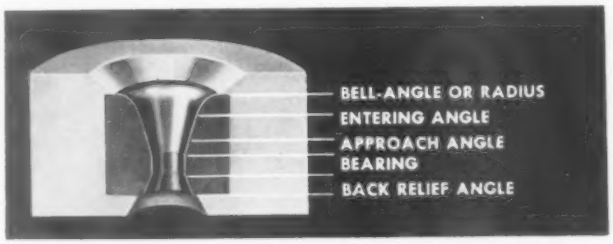


FIG. 6. Modern die of sintered carbide. Photo by courtesy of Carboloy Company, Detroit.

Summing up the foregoing, we start (1) with a rod, which may be rolled or extruded, and which is further reduced in a draw bench prior to drawing into wire; (2) a partial reduction to permit entry into drawing die; (3) drawing out for wrap around pull-through sheave, and (4) in the case of multiple draws in the one machine, repetitions of (4) through the several dies in the series.

The number of dies used may vary from one to ten, each succeeding die effecting a further reduction. A copious flow of coolant holds down the heat generated by drawing, and tends to enhance surface finish as well as to prolong die life. As the wire leaves the final die in the series, it is wound up on a reel or spool, depending on the size of the wire.

If hard wire is desired, it may be left as drawn; if, however, it is to be soft, or if further reduction is necessary, it is next annealed. This is preferably done in sealed furnaces, to reduce oxidization and to hold down surface scale. The furnace proper may be sealed with water, contained in a tank. The loaded spools, reels or coils are placed on elevators, which are then lowered into the tank and swung into position under the furnace, when they are raised into the heat. After annealing, the batch is dropped down into the water and raised to floor level.

While not an essential part of drawing, it may be desirable to tin or galvanize the wire after drawing. This is done in pots, as schematically shown in Fig. 7. A number of wires are run through simultaneously, and held down in the lead or tin by means of counterweighted depressors. Should a wire break, the counterweight drops, automatically stopping the mechanism controlling that particular wire. Rate of travel, through the pot, is controlled by limit switches and constant speed pull-out sheaves which, in turn, drive the take-up reels by means of slipping belts. Thus, both tension and feed rate are constant.

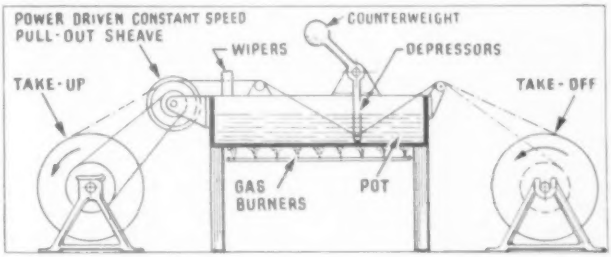


FIG. 7. Wire is tinned or zinc plated by running through molten metal.

It happens, occasionally, that wire breaks in the drawing, when the ends must be welded together. This procedure is rather simple, involving nothing more than a spring clamp in which the wires are joined when, after spelter—or thin silver solder—and a flux are added, they are fused by passing an electric current through the electrodes of the clamp. High bunches are filed off, when the draw is resumed.

One of the "headaches," in connection with wire drawing, is the number of gages used—eight in all. And oddly enough, the only one legalized by Act of Congress is the Birmingham gage, which is now practically obsolete. Of the rest—American or B & S; W & M, Am. Steel & Wire and Roebling; Stubs Steel Wire; Trenton; British Imperial and U. S. Standard for Plate, the sizes run from .580″ down to almost gossamer fineness, and cover about every requirement where wire is used.

However, this multiplicity of gages is a source of considerable annoyance and confusion, especially to occasional users of wire who may not be familiar with the several standards. And, unless a manufacturer specializes in one or two sizes, it is also expensive in that it greatly multiplies his inventory of dies and snap gages. As it is, increments between gages may be exactly alike, although numbers may differ, or, they may vary only by fractional thousandths of an inch.

However, the American or Brown & Sharpe gage is universally employed, throughout the United States, for copper wire as used in the electrical trades. And, as the electrical trade uses the circular mil—the area of a circle .001″ in diameter—this may be assumed as a basis, now gaining favor, for designating all wire in decimals of an inch rather than by gage numbers.

The foregoing article treats an intermediate stage in the manufacture of wire, and will be elaborated on in the next instalment—No. 5 of this series. In that article, we will discuss the stranding of Wire, as for the manufacture of light, flexible high tension cable and heavy electrical conductors.

By E. H. Gurney

Research and Quality Control of Materials

Thorough knowledge of quality factors provided by research, is basis of control system which assures marked increase in uniformity of product.

The application of research is certain means of increasing production by the improvement of existing methods of industry and the creation of new industries. Conversely the lack of it spells stagnation and ultimate bankruptcy." This quotation, from the conclusions of a committee appointed by the Federation of British Industry, is applicable to Quality Control, which has its very genesis in research.

Mr. E. H. Gurney **is president of the Gurney Foundry Co., Ltd., and of Associate Companies, also of Electric Steels, Ltd., a management company operating the Government Arsenal at Three Rivers, Quebec. He is chairman of the Ontario Research Foundation, and, during the World War I, was director of the Imperial Munitions Board.**

This proposition need not be argued with a group of Tool Engineers, but granted it is truth, there are certain startling figures available which indicate where we, as Canadians, stand in relation to other countries on research.

In the period between 1934 and 1938 Russia was spending per capita, for research, from $1.80 to $3.00 per annum; the United States $2.40; Great Britain $.70 and Canada between $.22 and $.29. (These figures are approximate, but on a comparable basis.) This means that we in Canada were spending on research approximately $2,000,000 against an American expenditure of $300,000,000. Against this, of course, must be placed the fact that many Canadian companies are in position to draw on the research results of parent companies elsewhere, but, even taking into account these circumstances, we cannot account for such a disparity.

Research Growing Rapidly

The American figures grew by leaps and bounds in the period between the two wars, and this is particularly true with regard to applied research paid for through private funds, by industrial companies in their own laboratories. Here are some figures: In 1920, in the United States, 300 industrial companies had laboratories employing 3000 persons; in 1930, 1625 companies—or more than five times as many—had labs employing 34,200 persons. And in 1940, 2350 industrial companies—that is, just short of 8 times as many—had labs employing 70,000 persons.

These figures are taken from authoritative sources and after careful investigation, and the opinion is that this rate of increase will continue and probably accelerate immediately after the war. That this situation is keenly appreciated is evidenced on every hand, with many private companies making plans along these lines for the postwar period.

The Prime Minister of Ontario has shown a lively interest in the subject and has appointed a committee under President Wallace of Queen's University (who, by the way, is one of the few university presidents who has come up by way of applied science), to investigate the coordination of research and recommend what steps should be taken to improve the situation both with regard to the quality and quantity of research. Similar steps are being initiated by the Dominion government at Ottawa, and other provinces besides Ontario are entering the field. The Ontario Research Foundation, established in 1927, offers certain facilities to those companies who are not in a position to conduct their own research.

From the beginning, this phase of our work has received full emphasis. We have, of course, conducted fundamental studies in addition to other work in the public interest, which need not be touched on here. Last year, however, we served 431 private companies, and now not less than 13 companies are carrying at least one full-time man—known as a "fellow"—on the staff.

Competent, Experienced Men

These men, of course, enjoy the benefits of the co-operation and support of their colleagues at the Ontario Research Foundation, and, as in most research centers, the backbone of the whole thing is the small group of competent and experienced men. A large proportion not only had a distinguished record in academic research, but, both before and after coming to us, have shown a capacity to investigate problems which arise in the conduct of manufacturing operations. This makes it easier for them to arrive at a common ground with men of your own type and experience.

Now, a word or two about what we are not. We have our mutual suspicions about the expert who claims to know everything about your job and who, for a stipend, will cause trouble to vanish overnight and forever. The Foundation is not and never will be in that class. Any success we achieve is based on the pooling of successes and knowledge, and comes only as a result of combined effort. That is the main reason why you will not hear much noise over what we do. In most cases we owe so much to men like yourselves, tool engineers who combine technical training with practical experience.

Test-Tube to Production

The labs are organized under the following heads; Metallurgy; Bio-Chemistry; Chemistry and Textiles. These labels means that we are equipped with apparatus, and staffed, to undertake applied research in a wide industrial field covering chemicals and phyical tests on ceramics, foods, vegetables, oils, paints and lacquers, paper, plastics, textiles, the fermentation industry, and so on. Space and facilities are available to carry the investigation through the test tube to planning of large scale operations.

We have space enough so that, where necessary, we can set up a small plant for a complete sequence of operations. As we are a non-profit organization this is done at cost, and, what is important to industrialists—we keep secrets! Any manufacturer who comes to us can do so with entire confidence that his problems are not going to be used as advertising material, and that his imposed trust in us, which we try to discharge faithfully, will be held inviolate.

Summary of paper presented at a recent meeting of Niagara District Chapter, A.S.T.E.

For obvious reasons, the problem of relating applied research to a particular industry has always been more difficult to the smaller companies than to the larger ones. It is to be hoped that there will always be many small, prosperous companies engaged in manufacturing, and, therefore, the problem of relating the sort of thing just described to the smaller company is of particular interest to all of us at the Foundation.

We come, now, to something that is very important—the modern viewpoint of smaller companies toward research. A publication by the Manchester Chamber of Commerce described a series of four meetings between industry and leading research workers in Great Britain. During the course of these discussions, Mr. G. C. Reynolds, Chairman of the Engineering Section of the Manchester Chamber of Commerce, made what appears to be an exceedingly interesting suggestion. He outlined how easy it was for a smaller business to be traditional up to the point where it became old-fashioned, and perhaps out-moded. He indicated that, in his opinon, the prevention of this could be found in a simple plan.

He suggested that each smaller industry—any company employing less than 1000 people—should appoint to its Board, or perhaps to a Vice-Presidency, one senior member who would have a broad scientific background and whose first duty would be to relate new knowledge, either in methods or in design, to his company.

One Official Responsible for Research

Mr. Reynolds indicated that he did not believe that such an official should do research work himself, but that he should sit in at the councils of the business and report to the heads. He should be given the serious charge of keeping that company from going to seed by seeing that all new knowledge was readily available and that where specific problems came up, science was related to their solution.

As one of the smaller companies, we propose to do that. Yet, there is reason to believe that if that man is given that charge, as one of several duties, it just won't work. That is because the world is moving too fast, and the man who discharges that obligation will have no time for manifold other things. However, the combination of some such plan as this, together with such facilities as are offered by the Ontario Research Foundation, might be of the utmost value in the postwar period. We must remember that our great record throughout the war, as manufacturers in Canada and elsewhere, has been made because all sorts of research work has been made available to us largely because the facilities of the Allies were pooled.

Postwar Co-operation in Research

We cannot hope to receive drawings for a washing machine in the postwar in the same way that we received drawings of the Sherman Tank, the Bofors gun, etc., etc. We can, however, continue to benefit from cooperative research.

We have learned a good deal about manufacturing during the past five years, and now, we might bring out what has been the most important single lesson that has come to us over this period, insofar as it relates to applied research.

Since the beginning of the war, the writer has been chief executive of a company operating a highly mechanized government steel foundry in Quebec, as thoroughly specialized a foundry as one will find anywhere. You will appreciate this from the fact that we have made about one million tank tracks, between three and four million 3-inch trench mortar bombs, and about two hundred and twenty thousand 500-lb. aerial bombs—all from three patterns. From the standpoint of repetitive work, it has been the foundryman's dream. From the standpoint of specifications that had to be met, it has also been the foundryman's nightmare.

About two and a half years ago, the writer heard of a new system—known as statistical Quality Control—for the elimination of too wide variables in the manufacture of a product and in the relation of such variations as must take place to a definite point. At the time we learned of this method, we thought that good practice with a particular formula (the ferro-manganese content was specified as 11 to 14 per cent) would give a foundry loss of from 10 to 15 per cent. With this method as an important contributing factor, however, we have been able to run under 3 per cent for the last three months that we have been operating and by that, we mean averaging every day during the three months.

Statistical Quality Control

We would like to give you some idea of how a statistical Quality Control scheme was operated, in connection with our production of tank shoes, so as to produce these very gratifying results. In the first place, the idea behind the whole thing was to control the quality of the product by establishing control of the important factors that governed the quality. These factors included such items as the properties of the raw materials; the compositions, temperatures, and operating schedules used in the process; the properties of the product at different stages of the manufacturing process, and many other factors.

After the important factors had been selected, their relation to the process was carefully studied and a running record kept of their variations. A similar record was kept of the properties of the product which reflected its quality.

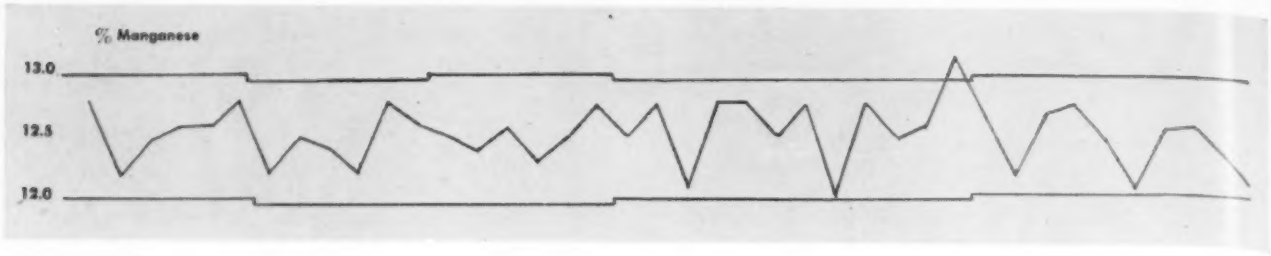
The object of statistical Quality Control was to ascertain the most important factors, to get them under control and, finally, to control them at optimum levels which would result in the highest quality of product. The methods used were such that it was possible, at all times, to distinguish between variations in factors, or of product quality, which were due to the interaction of numerous small changes which would be difficult and uneconomic to eliminate, and variations which were due to causes which could and should be economically eliminated.

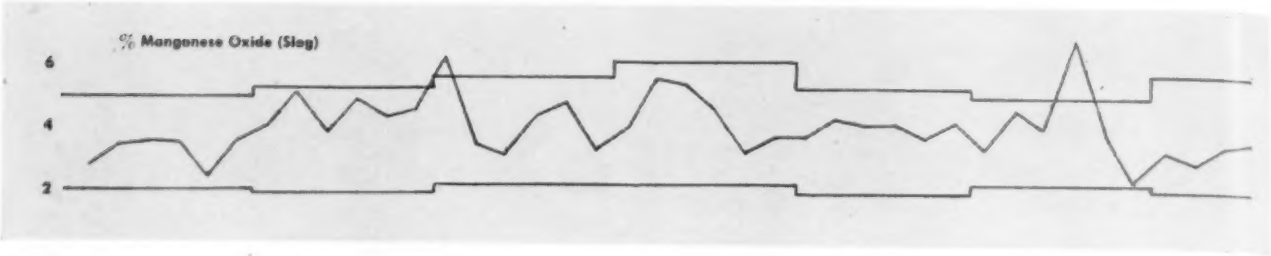
Graphs Control Processes and Quality

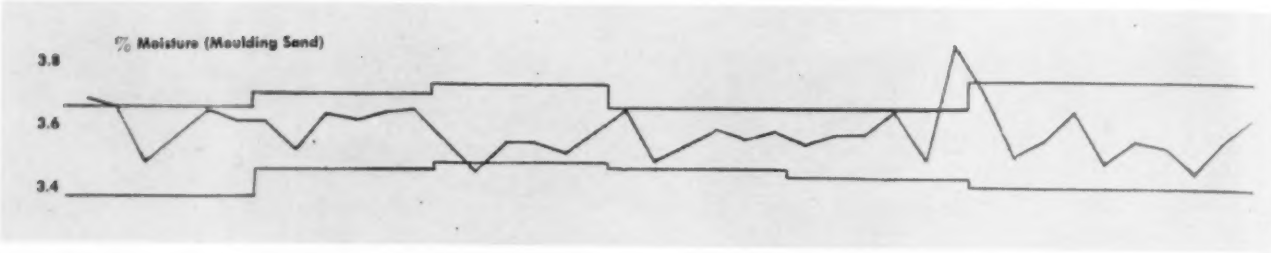
The chart in Fig. 1 will illustrate how this was done. The three upper graphs are representative of some 30 or more graphs which were used to control the important factors in the *manufacturing process*. The three lower graphs are representative of some ten or more which were used to record variations in *product quality*. All graphs were mounted one above the other, in the control room, so that all the data for one heat were in a vertical line. This alone accomplished a great deal. This information was much better, on a wall in the factory, than in some loose-leaf book, and both control and operating staffs soon learned to visualize, by studying the charts, what was happening and had been happening in the process.

Hold Quality Within Narrow Limits

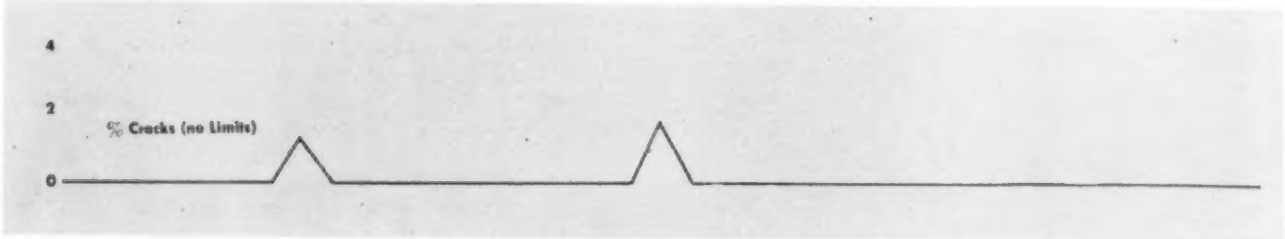
By referring to one of the process factor graphs on this chart, you will observe that it has two "tropics" or control limits. If the factor went outside these limits, we knew at once that some significant change had occurred in the process, and that we could investigate it without running much risk of going on a wild goose chase. By watching for any trends in the chart, it was often possible to spot a tendency to get out of control before it happened and thus initiate action well in advance of trouble.

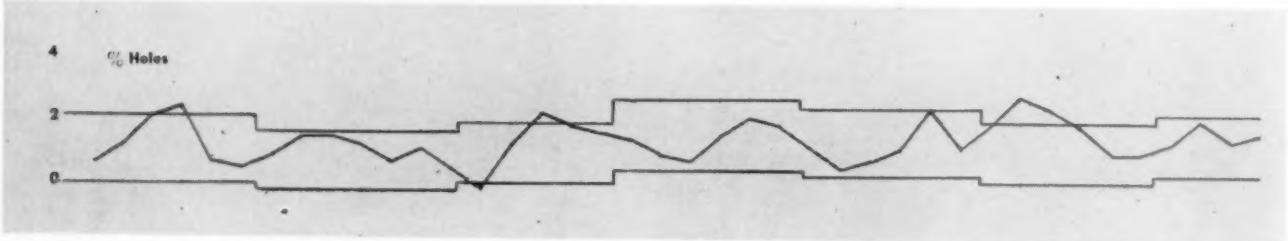


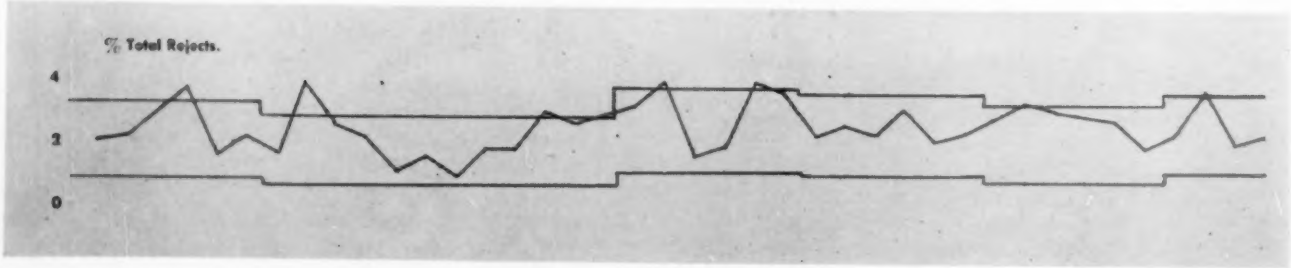




Process factor graphs, Figs. 1, 2 and 3, above. **Products graphs, Figs. 4, 5 and 6, below.**







Take the top graph, for the manganese content of the steel, as an example. Each point on the graph gives the average manganese content for one shift—the 8 to 4 shift in this case—during which 4 or 5 heats would be poured. The graph covers a period of about six weeks. Before Quality Control was introduced, we were satisfied to keep well inside the specification, which allowed the manganese to vary between 11 and 14 per cent. After Quality Control was established, as can be seen from the chart, it was possible to keep the points well within the control limits, and any failure to do so was promptly shown by the chart as illustrated by the high point towards the right.

Reduced Variations in Manganese

The next graph, Fig. 2, is a similar plot of manganese oxide in the slag. Before Quality Control, this averaged about 5 per cent and many of the points were out of control, some going to 9 per cent. After Quality Control, as you can see, the manganese oxide averaged about 3½ per cent and most of the points were within the limits, although further improvement was possible. The net effect is a lower manganese loss and a more uniform refining.

The third chart, Fig. 3, is a further illustration of the importance of small factors. Before Quality Control we were rather proud of the fact that we were controlling the shift average within 1 per cent. Under Quality Control, however, we were able by watching this factor more closely to get it within limits only about ⅓ per cent apart!

One important factor, not shown here, was silicon. This had a maximum specification of 1 per cent, and before Quality Control, we had to aim at about 0.5 per cent to be on the safe side. Consequently, we sometimes went as low as 0.35 per cent. Under Quality Control regulation, we were able to aim at 0.8 per cent quite safely, and it was predicted from an analysis of past data, and shown in practice, that this materially improved the quality of the product.

Assures Closer Control of Quality

In the case of the product graphs, illustrated at the bottom of the chart, there was a similar set of limit lines. In this case, points falling outside the limits, showed that the process was not yet in statistical control, and that a further improvement in quality was economically possible.

The first of these graphs, Fig. 4, gives the average per cent of cracked shoes in each shift. Before Quality Control, this graph was very erratic, with most of the points falling outside the limit. After Quality Control, as may be seen from this chart, cracked shoes were practically eliminated and showed up in only two shifts in the six week period.

The next graph, Fig. 5, shows the average percentage, under Quality Control, of shoes with holes in the 8 to 4 shift each day for six weeks. Before Quality Control, this chart was subject to very sharp peaks which raised our total per cent reject figure very materially. Under Quality Control, as shown in the chart, we were able to hold this defect to a low level and to keep it between limits, although the two points outside show that further improvement is possible.

Rejects Greatly Decreased

The total reject chart at the bottom, Fig. 6, tells very much the same story. Before Quality Control, the level was around 15 to 20 per cent and most of the points fell outside the statistical limits. After Quality Control, as shown in the chart, the line averaged about 2.5 per cent and most of the points came inside the limits, although there was still an indication that better control was possible.

Finally, various methods were used, which will have to be passed over, which showed possible relations between the variations of process factors—such as those shown in the upper charts—and product quality as shown at the bottom. From such studies, several valuable suggestions were made regarding possible ways of improving the process.

Constant Revision Necessary

Now there is much more to this system than the writer has indicated, and it is not quite as simple as it sounds. It is a job for a combination of scientist and mathematician to draw those limit lines for most products, and to make the other calculations and deductions that enter into the scheme. Also, these control lines have to be reset at regular intervals and conclusions continually modified as more data becomes available.

Dr. Westman, of the University of Toronto, was one of the original authors of the text book on this subject, which was put out by the American Society for Testing Materials. When the writer was apprised of this, we arranged that the Ontario Research Foundation would take charge of installing this method in the plant of Electric Steels Limited, at Three Rivers, the Government Industry referred to. We have spent on it perhaps $15,000,000, but we have saved very important sums of money—many times this sum!—and we are now expanding its application to other products.

Sometime last fall, we were informed that a school was being operated, under the auspices of the Office of Production Research and Development, at the University of Illinois at Urbana. Under the rules formulated, men were to go there for about eight days, were to do about nine hours work a day and learn this new scheme and then to undertake to return every so often for a refresher course. The first day, reserved for executives, was to tell them what it was all about and the writer went down for one day. Dr. Westman and Mr. Freeman, however, stayed for the entire course. What astounded the writer about the whole situation were the following facts: (1) about 175 men were there in attendance for the whole course, (2) that this was the 30th school of the kind which had been held in important centers of the United States, and (3) that the only possible application of the system was to a very repetitive form of manufacturing. While there, however, the writer learned that Curtiss-Wright were using it, in Buffalo, to build bombers, and finally that Ford is applying it, this year, throughout all his manufacturing processes.

Since then, two courses have been initiated, one under Dr. Westman at the University of Toronto and, just recently, one at McGill in Montreal.

Must Be Properly Installed and Operated

So there is a challenge for some of you, since one may be sure that few manufacturers, even if they take the course, are qualified to design their own set-up for this application without the help of first-class research workers. It is painstaking business to get this thing set up, especially since there are one or two jokers in connection with it.

First of all, it is a positively dangerous tool in the hands of people who lack the scientific background to correctly lay down the rules, or who lack experience in solving the technical problems of industry. The Ontario Research Foundation has, through its staff, an intimate knowledge of the fundamental rules governing the use of Quality Control. Dr. Westman has been a pioneer in this field over a period of years, and both he and his group have supervised the installation of such systems, both in the plant for which the writer is responsible, and elsewhere.

Because of the great difficulty we experience in getting technical staff, we are limited, at the moment, as to the number of people to whom we can render assistance. You

may have heard something like that before, during the war. We do, however, look forward to the day when we can render real assistance, in utilizing this method, to an important number of Ontario manufacturers.

Secondly, it is not quite clear to the writer, as yet, to whom the people who operate the system should report. It can easily happen that this method may be regarded, by the personnel of the staff, as a spy system. At Three Rivers, we initiated it in a chart room in the plant with the operator reporting to the plant manager, but we believe that, in its extension, we will put it directly under the foreman concerned, with right of appeal to the operator higher up. Like anything else in a plant, it just won't work without the proper spirit of cooperation.

The writer has taken some little time to illustrate just one of the many ways of relating research to the day to day problems of a plant. Equally important, of course, are new methods, and perhaps more important still, new designs and materials. During the last strenuous five years, the Canadian manufacturer has shown that he is a match for any manufacturer anywhere, provided he is accorded an even opportunity with respect to access to scientific knowledge. But, if we revert to the low expenditures on research which the writer mentioned at the beginning of this article, we, as manufacturers will be entering a 100-yard race with 30-pound iron shoes. We believe, however, that this situation is pretty generally appreciated, today, by both Canadian manufacturers and by the Dominion and Provincial governments, and that we may hope to meet our competitors abroad on an even basis so far as this all-important outlook is concerned.

Apology

We deeply regret the error that was made in the June issue in the spelling of the name of the Society's great friend and counselor, J. H. Van Deventer, President of THE IRON AGE, whose paper "Postwar Expectations Versus Realities" appeared in that issue.

Production on General Electric Jet Engines

INTERESTING phases of production on the powerful G.E. jet engine, as manufactured at General Electric's Lynn (Mass.) River Works, are shown in the illustrations. As will be noted, the assembly consists of a number of parts, especially an outer and inner section, both having symmetrically machined contours consisting of several radii and angles blending into an irregular shaped passage.

The inner section of the casting has a number of spiral grooves, the radii of which blend into a 15° downward slope. This part is machined on a 54" vertical boring mill equipped with specially designed tools. The radius tool consists of a cast quadrant mounted on a fabricated supporting member. A sliding block, provided with a Carboloy tipped tool, travels on the quadrant. Tool setting is by means of a reference button on the sliding block.

Radius machining starts at the low point and travels upward, with feed effected by a cable, one end of which is attached to the block, the other to the side head of the machine. The power feed of the machine is used to make the cutting tool follow the path of the quadrant.

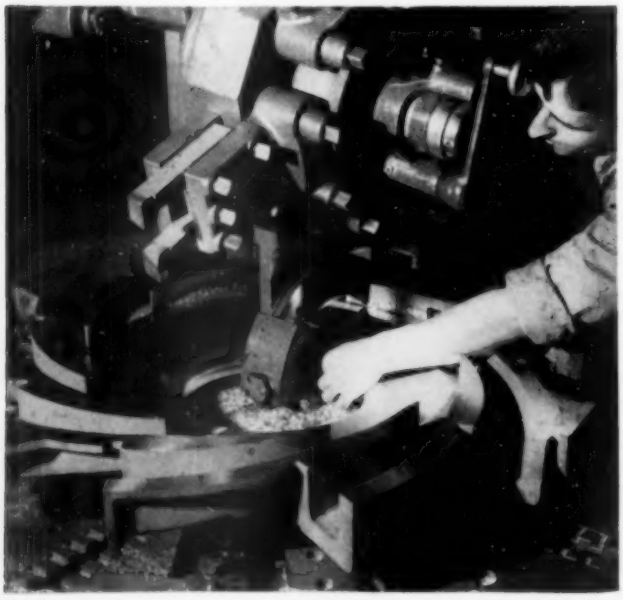
The tool set-up, which is extremely simple in construction, is a decided improvement on the previous method of using a form tool in a plunge cut. The single pointed tool now used to generate the curves eliminates chatter and produces a fine finish.

Several sections comprise the outer casing, with radii and angles largely corresponding to the inner section. Machining has been greatly simplified by the use of hydraulically controlled vertical millers provided with automatic depth control and a 360° horizontal profile circuit of the selective type.

The casting is mounted on a specially designed indexing fixture. To prevent chip loading, an end mill with three staggered Carboloy inserts is used. The stock removed varies in depth up to ¼", the operator varying the feed rate in the weak sections of the contour.

Two master blocks, provided with the correct contour, are mounted on the right hand side of the miller cable. One block controls the horizontal travel of the end mill, while the other simultaneously controls the vertical travel. When the cutter has completed its circuit, it travels away from the casting to permit indexing to the next passage. The cycle is repeated for each vane.

Profile machining of spiral vanes for jet engine on a 54" boring mill. Mass production of G.E. jet engines, Lynn (Mass.) River Works.



Profile milling of outer casings on hydraulically controlled vertical milling machines.

By Franklin J. Blaney *

Spiral Grinding Of Tools

Thread grinding principles used as a basis—Strive for ideals to achieve practical results.

IN SOME respects, the spiral grinding of tools is similar to ordinary thread grinding, such as suggested in Fig. 1. Here, the relation of the helix angle of the thread to the setting of the grinding wheel is clearly indicated.

However, by referring to Fig. 2 (an enlarged view of the wheel at work) we find that, instead of grinding a straight line, it grinds a slight concave as shown exaggerated by the dotted lines. Also, there is a tendency to concavity along line A, B, C to F; however, since all these points break away from the flank of the thread as soon as they leave their points of contact, the grind is straight to all practical purposes and no harm is done.

In Fig. 3 is shown what would happen were one to attempt to grind a square thread. Instead of the desired straight edge, along H, we would have a concave line along G. This deviation is caused, naturally, by the lead of the thread. While this condition would be greatly improved, but not entirely eliminated, by bringing the wheel in at an angle as shown in Fig. 4, it becomes apparent that the only practical way to produce a straight edge along line U-Z is to make these points the only place where the thread and the wheel come in contact.

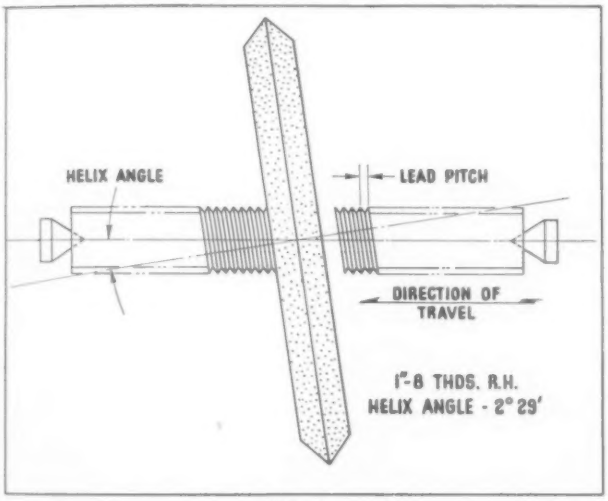


FIG. 1.

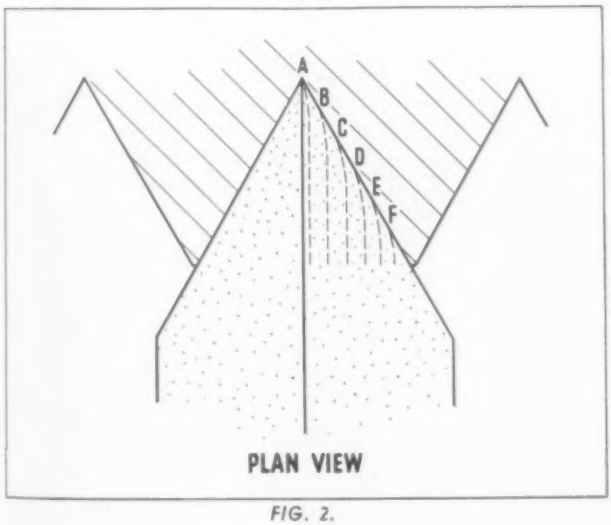


FIG. 2.

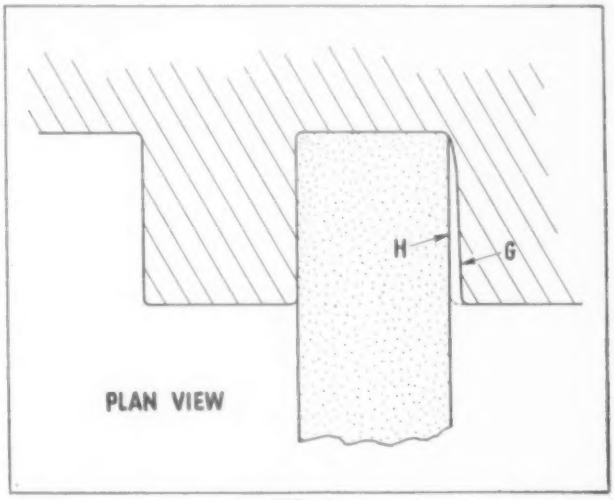


FIG. 3.

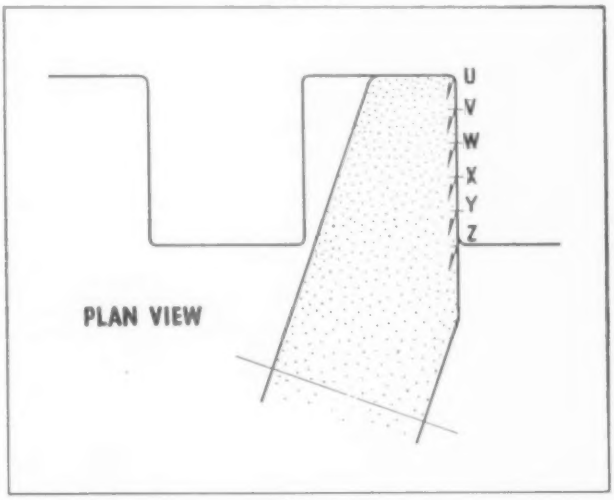


FIG. 4.

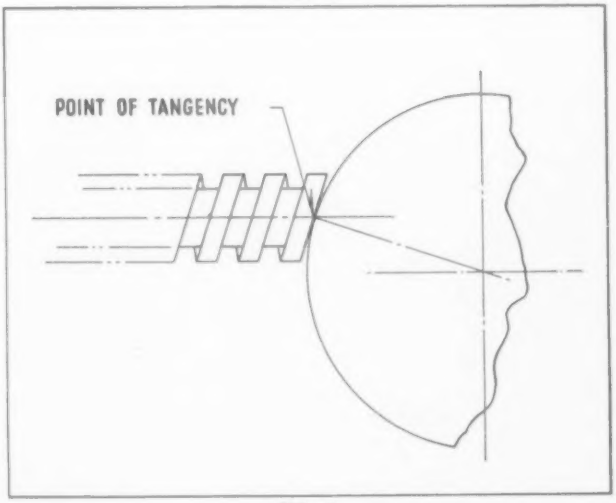


FIG. 5.

* Tool Engineer, National Acme Company.

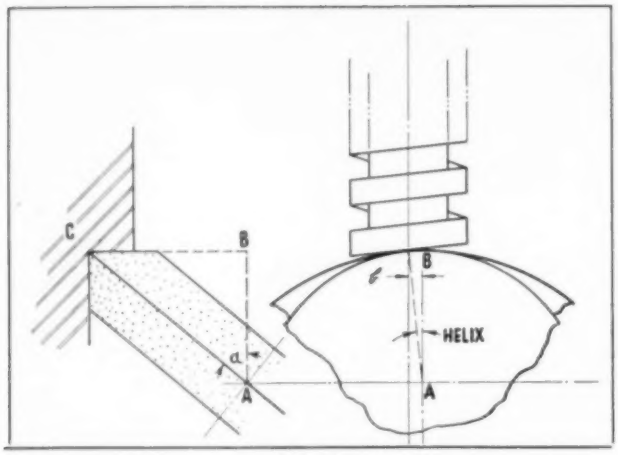


FIG. 6.

Now, according to geometrical theory, "a line drawn tangent to a circle touches the circle at one point," and, "a line drawn at right angles from this point will pass through the center of the circle." Fig. 5 shows the relationship between this theory—or should we say fact?—and the thread and wheel. The difference in height of the wheel and thread can easily be calculated—viz: the tangent of the helix angle times the wheel radius.

In Fig. 5, however, the wheel is parallel to the horizontal axis of the thread and not at an angle as shown in Fig. 4. If the wheel is as shown in this position, then the offset (difference in center lines between the work and the wheel) can be calculated to ascertain the correct point of tangency for the specified lead and helix angle.

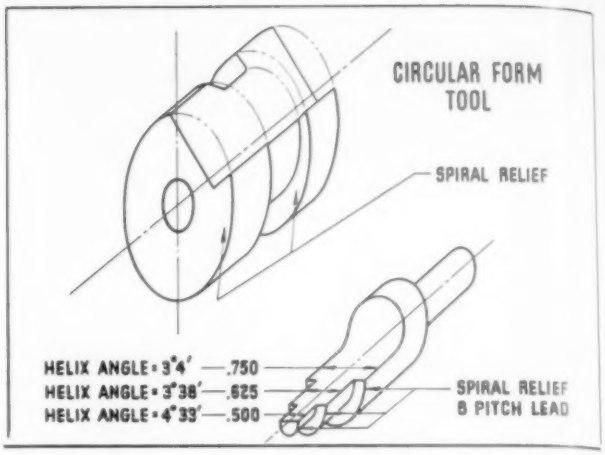


FIG. 7.

This becomes evident by referring to Fig 6, in which line A-C is one-half the wheel diameter. Angle is optional although, in this case, 45° may be assumed. Distance A-B is cosine times A-C. Then, A-B (at right) times the tangent of the helix angle b becomes the distance to drop the wheel to form a tangent with the work. Since, however, the helix angle varies with diameter, the point of tangency must likewise be changed to correspond.

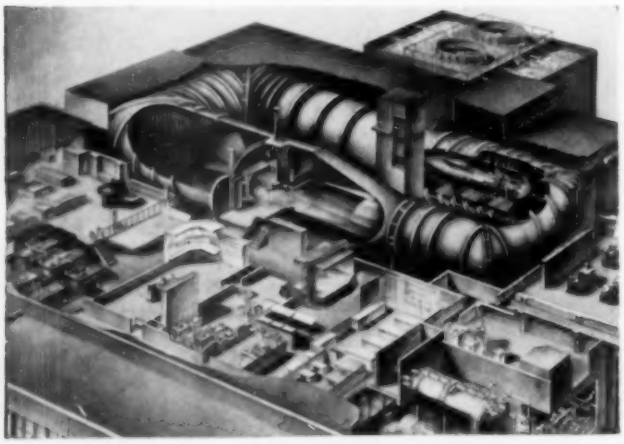
In Fig. 7 is shown a 3-step counterbore in which the helix angle on all three steps is different. Consequently, the offset must be calculated for each step. In any event, however—that is, whether one grinds single or multiple steps—this method can be applied to recessing tools, circular form tools, counterbores and any cutting tools ground on a helix.

A "Tool" on a Huge Scale

OF A scope best visualized from the cutaway view and the detail of the operating "console" (left foreground in cutaway), a giant wind tunnel, soon to go into operation at the Curtiss-Wright plant at Buffalo, will permit testing of airplane models of 10 ft. wing span. It will not only serve as a Curtiss "proving ground," but may be available, as a testing lab, for other eastern aircraft manufacturers.

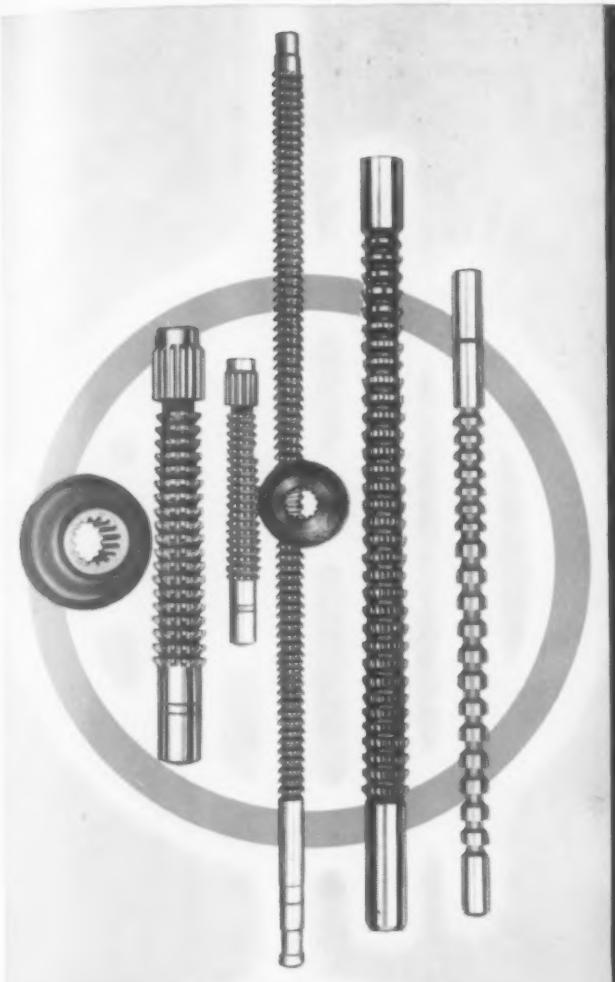
The tunnel is 378 feet in circuit, has an air volume of 240,000 cu. ft. and, employing four special compressors, air in the ¾" thick shell may be pumped to 4 atmospheres—or 60 P.S.I.—or, it may be evacuated to a sub-pressure or 4 P.S.I. which is equivalent to the minimum pressure encountered at 35,000 ft. altitude. In this connection the test chamber may be sealed off, to permit models in the chamber to be worked on without changing the test pressure.

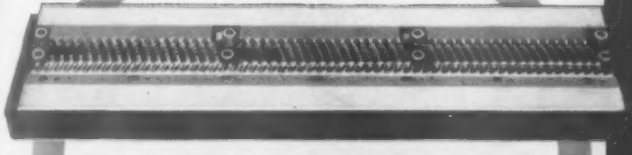
Powered by a General Electric System, the 115,000 volt power supply is brought in through a 10,000 kilovolt-ampere outdoor substation, where it is reduced to 4,800 volts for use with the 14,000 h.p. General Electric drive motors. This power service is adequate, should occasion arise, to operate the tunnel throughout the 24 hours of the day. Huge as the "tool" is, it may be efficiently operated by a crew of three men. Operation may be entirely remote, from the "console" just outside of the tunnel.

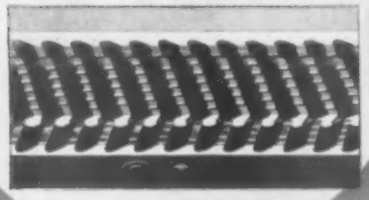


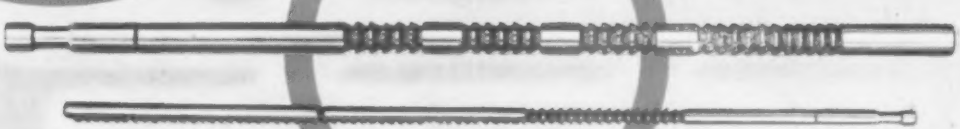
Cutaway model of huge $2,500,000 wind tunnel, soon to be in operation at the Curtiss-Wright Research Laboratories at Buffalo. Model shop, where scale models are to be made, is in foreground.

The "console," shown just outside of wind tunnel (left foreground) in cutaway. The tunnel is designed to test planes up to the speed of jet propulsion, and at pressures simulating 35,000 feet altitude.









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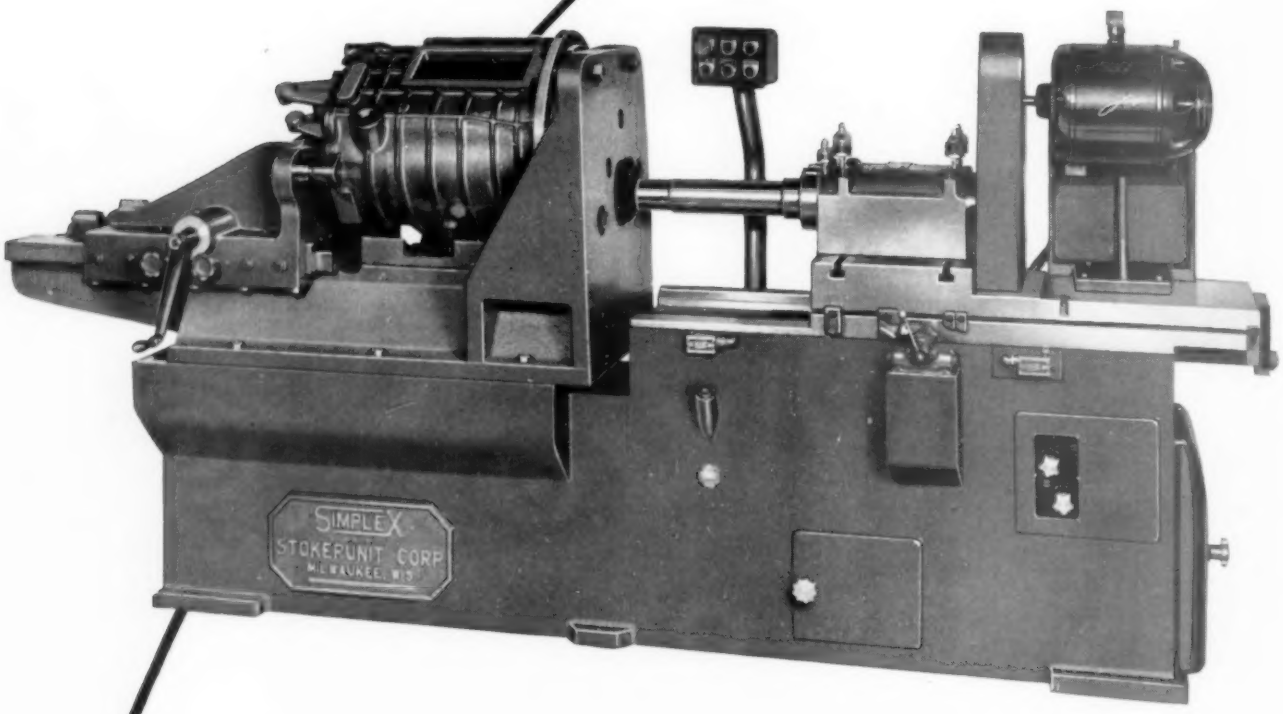

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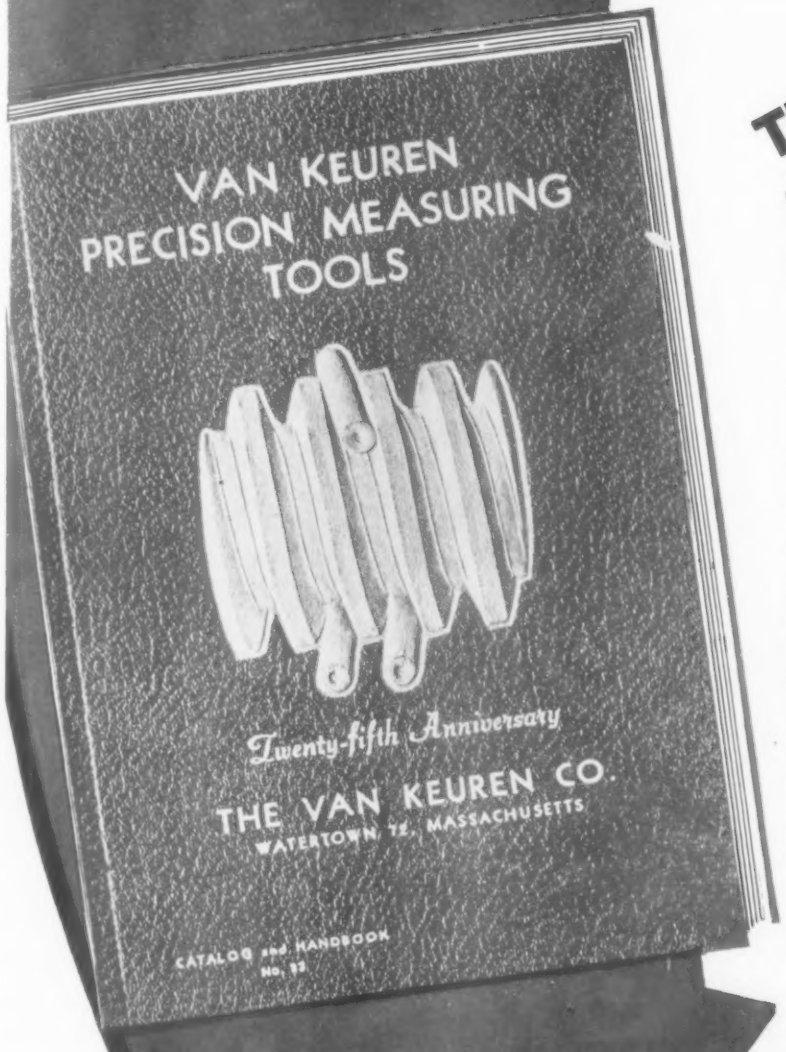

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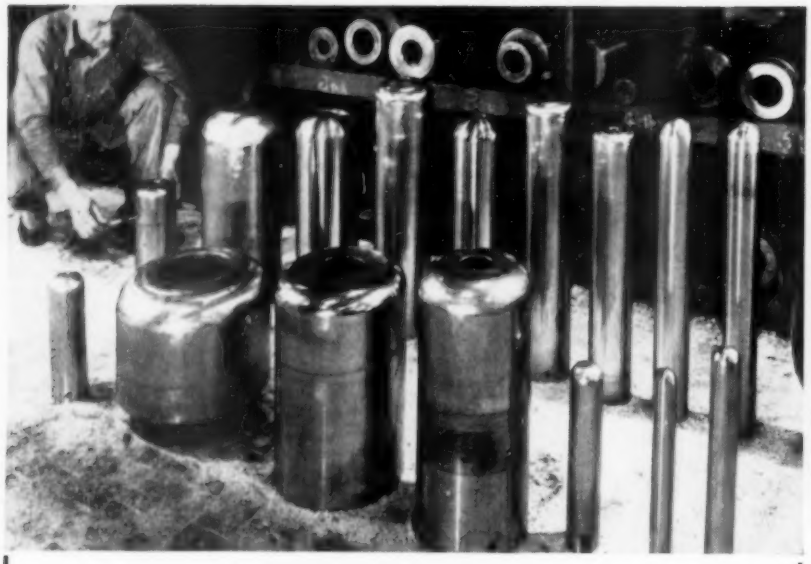

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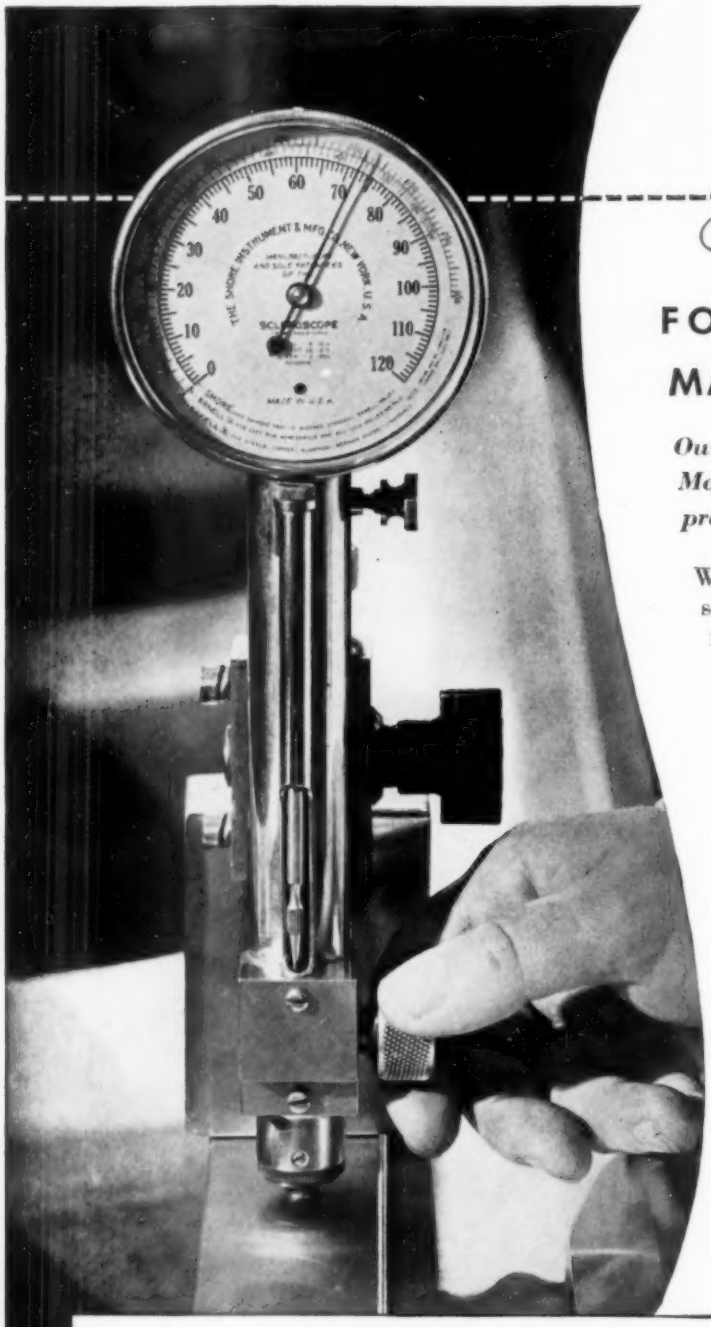

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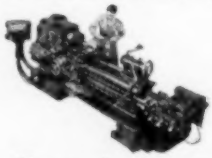
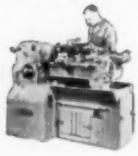


Monarch Shapemaster Formturning Machine with electric controls.



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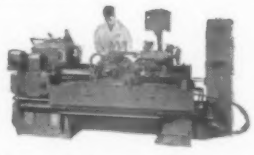

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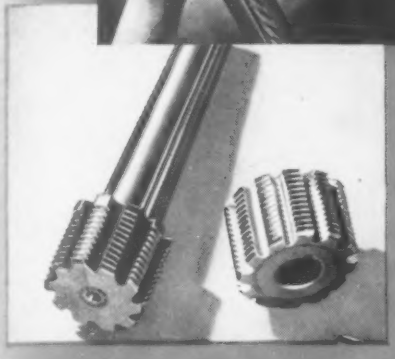

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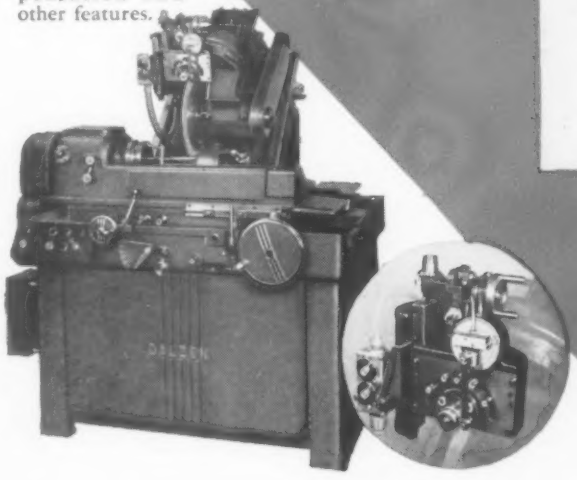

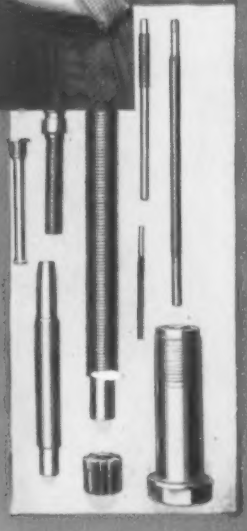

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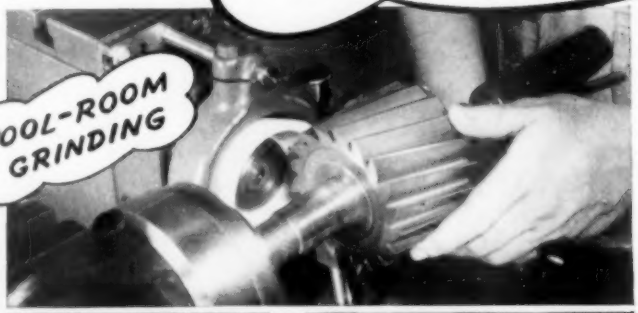

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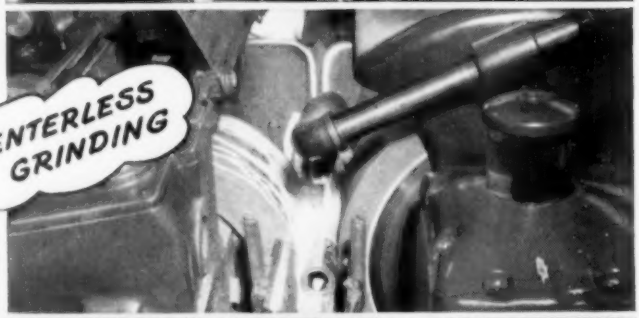

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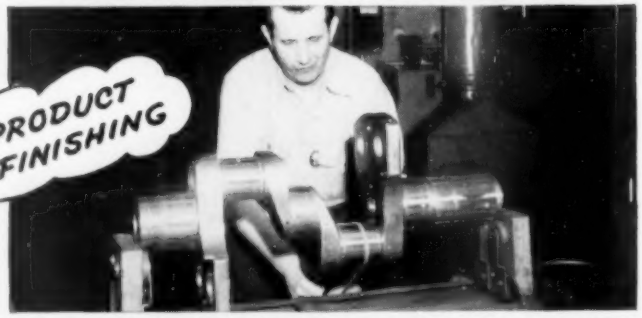

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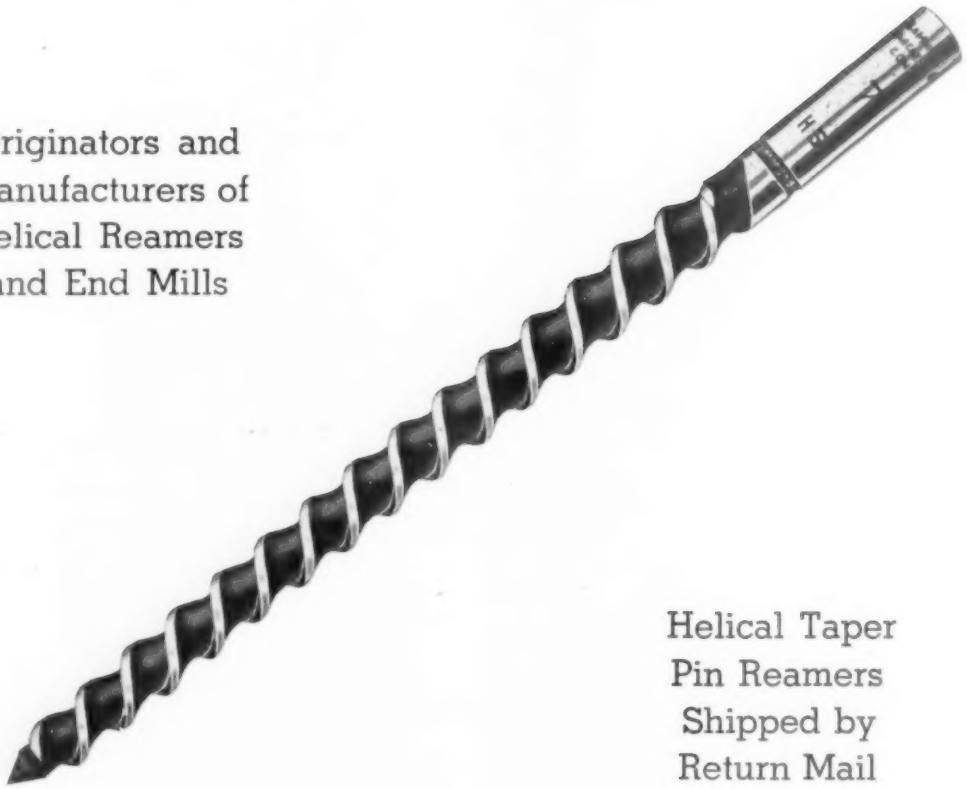

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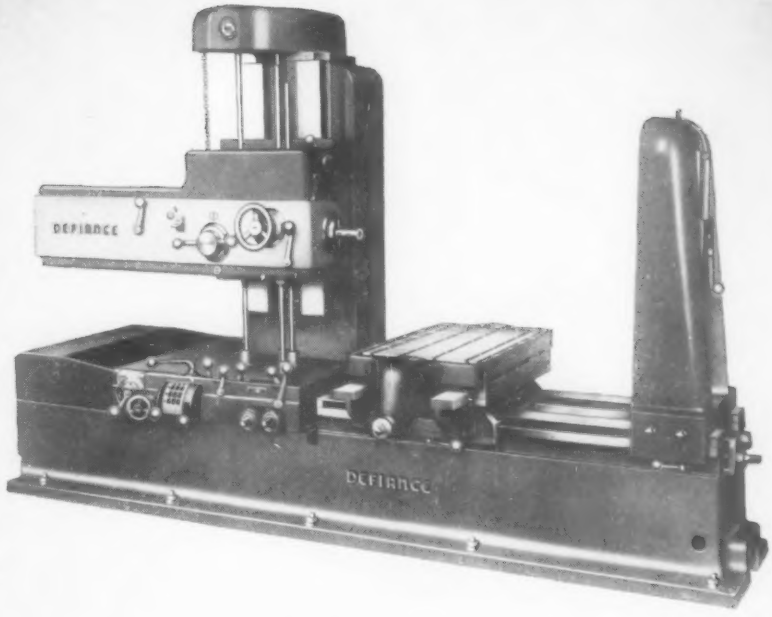

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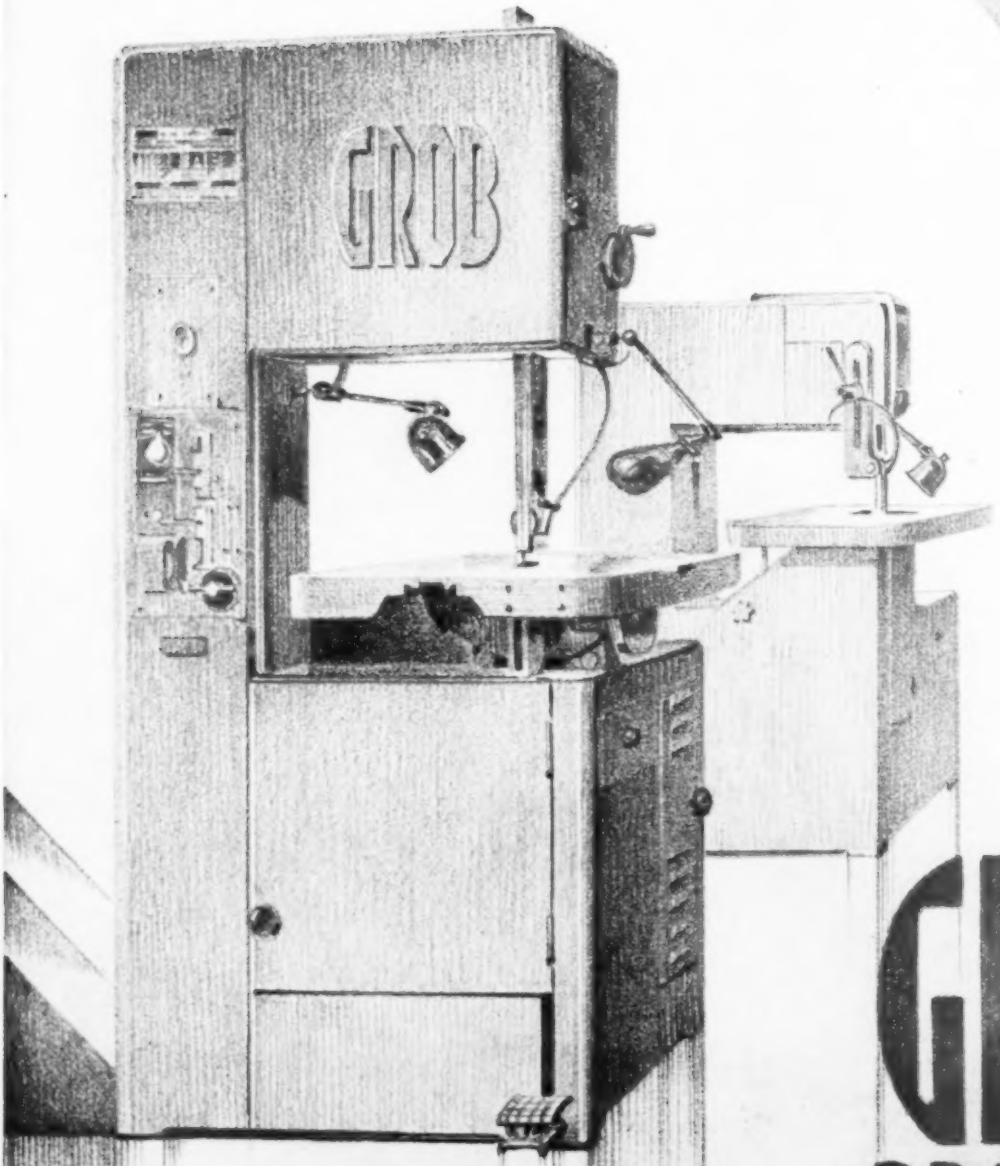

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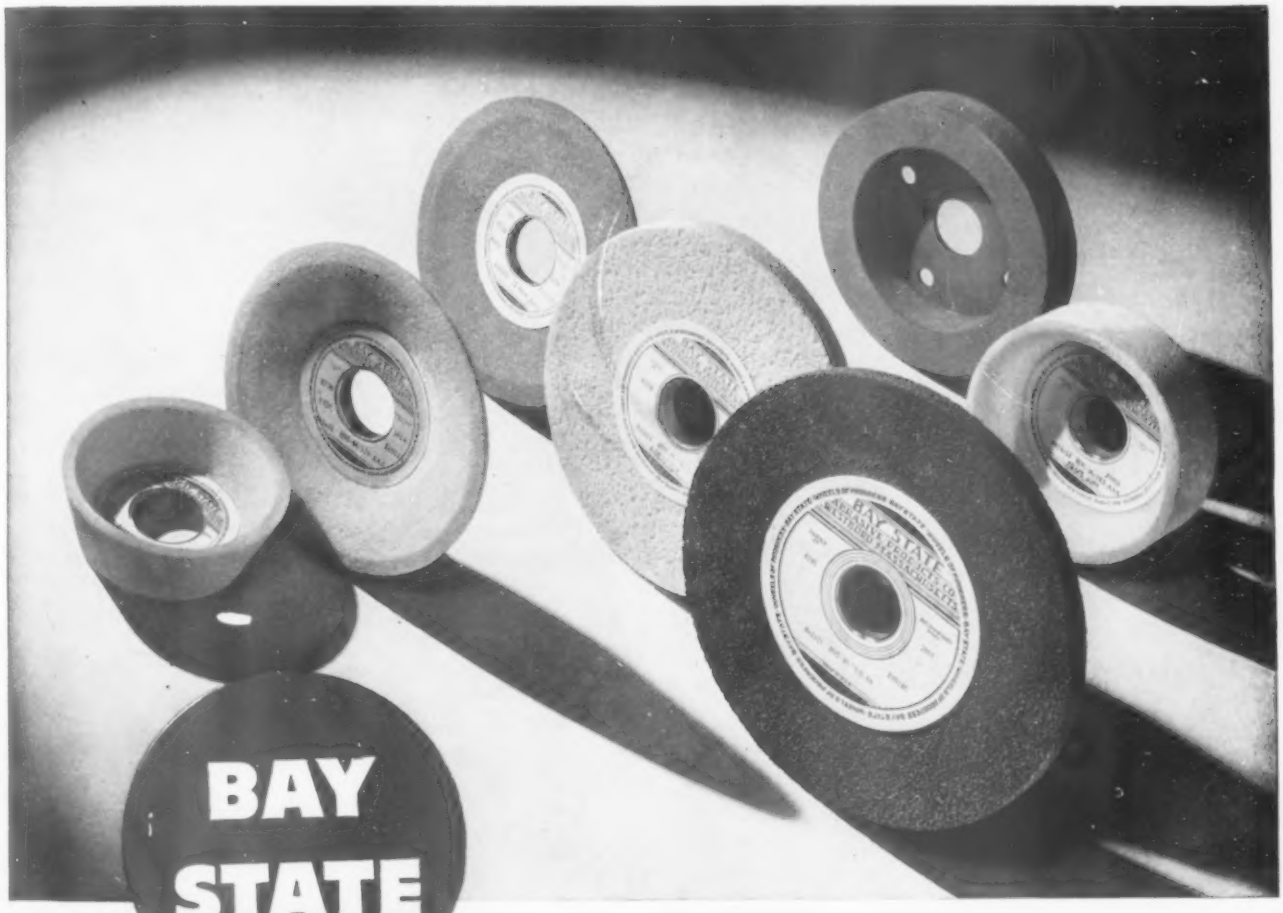

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A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

Society Charters "Cedar Rapids" As 71st Chapter

Cedar Rapids, Iowa—Manifestly efficient organizational work on the part of its temporary officers culminated in the granting of Charter 71, May 25, to Cedar Rapids Chapter, ASTE.

J. F. Plumb, Chairman of the Manufacturers' Bureau of the local Chamber of Commerce and an enthusiastic booster for the Chapter, opened the dinner meeting at the Hotel Roosevelt. Welcoming the Society to Cedar Rapids and extending the wholehearted co-operation of the Manufacturers Bureau, including the use of a meeting room and facilities for groups of 400-500, he introduced the Committee responsible for the Chapter's inception: Chairman John M. Speck, Machine Design Engineer, Cherry-Burrell Corp.; First Vice Chairman Michael J. Fitzgerald, Chief Tool Engineer, Collins Radio Co.; Second Vice Chairman James L. Sealy, Assistant Superintendent, Cedar Rapids Engineering Co.; Secretary John L. Stark, Tool Design Supervisor; and Treasurer Robert A. Hruska, Chief Tool Engineer, LaPlant-Choate Mfg. Co., Inc.

Acting Officers Confirmed

Taking the floor, Chairman Speck introduced President Briner of Cleveland, who outlined the purposes, history and activities of the Society and conducted the election of Chapter Officers. By unanimous vote, the acting officers were retained for the ensuing year, President Briner installing them and presenting the charter to Mr. Speck.

Executive Secretary Adrian L. Potter of Detroit distributed to the members of the Executive Committee the materials needed in the conduct of their respective offices, explaining to each his duties and responsibilities.

Among out-of-town guests was a delegation from the neighboring Tri-Cities Chapter, including Past Chairmen Sigurd Lunde, O. R. Reller, F. J. Siebenmann, T. L. Ramsey, and W. Z. Fidler, the latter presenting on their behalf a chairman's gavel and marble block suitably inscribed.

Pledging the co-operation of Tri-Cities Chapter, Mr. Fidler passed along the advice of Past President Walter Wagner who chartered their group with the challenge that "a good member of ASTE never says 'No' when he is asked to do something."

Co-operation Stressed

Speaker at the Chapter's first technical session was Lloyd L. Lee, Vice President in Charge of Engineering and Sales, Plan-O-Mill Corporation, Hazel Park, Mich. Mr. Lee discussed the advantages and limitations of "Planetary Milling," a process permitting considerable latitude ranging from a 5/16" external thread to a 3 or 4 inch internal thread in relatively short change-over time. Impractical for short runs because of the prohibitive cost of cutters and fixtures, it is particularly adapted to production threading of blind holes and for threading jobs demanding accuracy, alignment and finish at a high production rate, according to the speaker.

Mr. Lee's paper followed in substance his article on this subject published in the March issue of *The Tool Engineer*. Slides served to illustrate the operations described.

Eighty members and guests were recorded in the Chapter's guest register.

The successful launching of the new group is the result of the diligence of its officers who have met regularly and faithfully two or three times a month since January, developing plans for building membership, reviewing applications, preparing an outstanding piece of promotional literature, and working out the details of the charter night.

A well-diversified cross-section of industry is represented in the 55 charter members of exceptionally high caliber, associated with Cedar Rapids Engineering Company, Cherry-Burrell Corporation, Collins Radio Company, C. A. Dunham Company, LaPlant - Choate Mfg. Company, University of Iowa, Universal Engineering Corporation, and U. S. Navy.

One of the world's leading manufacturing centers of road building machinery, the diversified industry of this thriving community of over 60,000 inhabitants augurs well for the postwar future of the new Chapter.

This is the splendid promotional literature prepared by the zealous group of Cedar Rapids ASTE'ers who, in four months, developed their membership to charter strength.

ASTE

Is an Organized and Functioning Institution for the Advancement of Scientific Knowledge in the Field of Tool Engineering.
ANYONE in the vicinity of CEDAR RAPIDS, IOWA, concerned with production and having the proper qualifications can now have the privilege of a membership in the AMERICAN SOCIETY OF TOOL ENGINEERS.
A CEDAR RAPIDS CHAPTER is being formed and a charter is imminent.
YOU MEN who are acquainted with the work of A.S.T.E. know the benefits of belonging to this organization.
EDUCATION is offered through the technical sessions, talks by capable speakers, motion pictures, and other training activities.
CHAPTER MEETINGS provide the opportunity for exchanging ideas with men in similar fields of endeavor.
PUBLICATIONS consisting of the monthly technical journal *THE TOOL ENGINEER* and DATA SHEETS are mailed to all members.
NATIONAL CONVENTIONS provide the opportunity to visit important plants and exchange ideas with Tool Engineers in other sections of the country.

For Additional Information and Application Blanks
Contact One of the Following Temporary Officers
John Speck, Chairman, 1921 Eighth Avenue, S.E.
Michael Fitzgerald, Vice-Chairman, 123 36th St., Dr., S.E.
John Stark, Secretary, 3519 Elm Avenue, S.E.
Robert Hruska, Treasurer, 222 27th Street, N.E.

A•S•T•E *NEWS*

A Publication of the American Society of Tool Engineers
1666 Penobscot Bldg.
Detroit 26, Michigan

Editor, Adrian L. Potter
Associate Editor, Doris B. Pratt

Low Velocity Vital In Hydraulic System

Columbus, Ohio—One of the most interesting phases of engineering, "Hydraulics As Applied to Machine Tools," was very comprehensively covered when John C. Wilson, Chief Engineer, Thompson Grinder Company, Springfield, addressed the May 9 meeting of Columbus Chapter at Fort Hayes Hotel.

Tracing the early history of hydraulic applications, Mr. Wilson explained how horsepower is arrived at in the design of hydraulic machines, displaying elementary designs and diagrams of hydraulic units, valves, and pumps.

Constant and Variable Pumps

Both constant and variable types of hydraulic pumps were referred to by the speaker, hydraulic valves being classified as needle, globe and gate. As applied to machine tools, the relief valve is for protection, the master valve for general operations of the hydraulic circuit, with the delaying valve used as a secondary unit, according to Mr. Wilson. The importance of low velocity throughout the hydraulic system was stressed as essential to retain precision and reduce heat. Motion pictures showing broach grinding and the crush form truing process were also shown.

Assisting Mr. Wilson in answering the many questions, concerning principles, results, and various production problems, were C. Boldenhofer, President and General Manager; R. Boldenhofer, Plant Manager; H. F. Smith, "B" Dept., Crush Grinding; and F. G. Krafft, Service Engineer, all of the Thompson Company.

During the serving of refreshments members and guests had an opportunity to inspect a display of tools, cutters, crushed form wheels and special parts.

Kennametal Names New Carbide Consultants

Latrobe, Pa.—Two ASTE'ers have been named to the staffs of Kennametal, Inc., district offices at Detroit, Michigan, and West Hartford, Connecticut, as consultants on carbide tool problems.

Gilbert A. Bunn, now at the Detroit office, has been superintendent of the torpedo plant and general foreman of the rear axle department of Pontiac Motors Company, after 20 years' experience in the production departments of various other manufacturers of automobiles and accessories. Mr. Bunn is affiliated with Flint Chapter, ASTE.

John H. Wright, newly appointed to the West Hartford, Connecticut, office, was formerly production foreman at Browne & Sharpe Mfg. Co., Providence, R.I., process engineer with Dexter Folder Company, Pearl River, N.Y., and tool designer and metallurgical engineer at the Bendix Aviation, Eclipse-Pioneer Division, Teterboro, N.J., after completing engineering studies at Brown University and New York University.

A member of Hartford Chapter, ASTE, Mr. Wright has served the N.Y. State Education Department at Pearl River, N.Y., as Director of Training for war production workers.

Kinsey Shows New Honing Methods

Binghamton, N. Y.—John W. Kinsey, Field Engineer, Micromatic Hone Corporation, Detroit, appeared before the 52 members and guests attending the May 9 dinner meeting of Binghamton Chapter at the Arlington Hotel, to discuss the subject of honing.

J. W. Kinsey

After briefly reviewing the history and development of honing, Mr. Kinsey showed sound films illustrating the fundamentals and modern applications of this process. The speaker also displayed samples of honed work, answering many questions concerning methods and equipment.

Participating in the chartering of Cedar Rapids Chapter, May 25, are left to right (seated): First Vice Chairman Michael J. Fitzgerald, Chairman John M. Speck, National President C. V. Briner of Cleveland, Lloyd L. Lee of Plan-O-Mill Corporation, Detroit, technical speaker at the meeting; (standing) Secretary John L. Stark, Treasurer Robert A. Hruska, and Executive Secretary Adrian L. Potter of the National Office.

COMING MEETINGS

DETROIT — July 28, Golf Party. Warren Valley Golf Club, 1 mile west of Telegraph, on Warren. Tee-off at noon. Free refreshments on course. Prizes. Dinner, 6:30 P.M.

ST. LOUIS—July 28, ASTE Picnic at Lemay Grove.

Pantographing To Aid Post War Tooling

Washington, D.C.—Applications of the pantographing machine to the job of retooling and converting to peacetime production were described by Elton Miottel, Customer Research Engineer, George Gorton Machine Company, Racine, Wisconsin, speaking before Potomac Chapter May 3 at the Hotel 2400.

He also elaborated on the value of the machine in expediting war plant production, with reduced costs plus increased quality. The accompanying sound film in technicolor showed tracer-controlled milling machines at work on war plant milling. Well-versed in the art of machine engraving and duplicating, Mr. Miottel presents an exceedingly interesting and educational talk.

The coffee talk was given by Frank A. Patterson, of the Frank A. Patterson School of Public Speaking, whose discourse on various phases of public speaking was most enjoyable.

* * *

H. J. Babcock, Research Engineer for Ajax Electric Company, Inc., Philadelphia, was featured at an earlier meeting in an interesting and enlightening address entitled, "Electric Salt Baths In Modern Electric Heat Treating."

Covering the history of the development of this method and its application in modern practice, he also discussed at length the new method of hardening steel by interrupted quenching, known as Isothermal Heat Treatment. Of particular interest to Tool Engineers, this phase of his talk pertained to the development of high physical strength and the control of internal stresses within steel being hardened. Mr. Babcock employed slides to illustrate the more salient points.

"Seabees," a sound film depicting the construction work being done under actual combat conditions by this branch of the service, was also shown.

The dinner meeting was attended by 125 members and guests.

WMC Training Program Helps Industry

Pittsburgh, Pa.—Noted for his work in the field of industrial education, Carl S. Coler, District Director, Training Within Industry, WMC, delivered a most interesting address, "Management Directors," when he appeared before the May 4 meeting of Pittsburgh Chapter at Fort Pitt Hotel.

Largely responsible for the success of the tremendous armament program, the War Manpower Commission's training plan has helped place workers in the jobs for which they are best equipped, greatly reducing the training period for new employees, and bringing about better industrial relations. Available to any manufacturer engaged in war production, this service has met with enthusiasm, the speaker indicated.

Approximately one hundred members and guests attended the dinner meeting.

Gearing Developed By Tool Engineers

Flint, Mich.—Crediting much of the present high state of gearing development to Tool Engineers, Charles H. Stanard, Production Gear Engineer, Buick Motor Division, outlined its history and applications for the 160 members and guests present at the May 24 meeting of Flint Chapter.

Chairman Michael Skunda presents technical speaker Charles H. Stanard of Buick Motor Division, Flint, to May 24 meeting of Flint Chapter.

Reviewing the 200–300 year background of gearing to its present use in the automotive and aviation industries, the speaker indicated that much of the mathematics and theory of modern gearing was known and understood prior to 1890.

Earlier practices in the production of gears such as cutting, hobbing and shaping have been largely replaced by broaching which is more economical from a tooling viewpoint.

In discussing the various production methods, Mr. Stanard urged Tool Engineers to use simple holding devices such as centers for locating wherever possible. Control of the dynamic load error, with consequent reduction of torque, was also recommended.

In passing, he mentioned machining methods likely to be adopted in the postwar period, the advantages of the proposed, standard involute spline system, and the important part Tool Engineers will play in the production of the accurate, compact gears of tomorrow, appealing for a continuation of the initiative and resourcefulness displayed in the manufacture of war materiel.

A master in the art of producing good gears, Mr. Stanard who is affiliated with Flint Chapter, ASTE, has been associated with the transmission industry from its inception in 1903 at Brown-Lipe Gear Company, Syracuse, New York, holding the unique distinction of having set up and operated the first gear hobbing machine in America.

The meeting followed a dinner served by the Herman Fischer Hotel in Frankenmuth.

Graphitic Steel Analysis

Newark, N.J.—Walter Hildorf of the Steel and Tubes Division, Timken Roller Bearing Company, Canton, Ohio, analyzed various graphitic steels in his discussion of this subject at the May 8 meeting of Northern New Jersey Chapter held in Robert Treat Hotel.

The speaker used slides to illustrate his lecture, answering questions from the floor in conclusion.

Through the courtesy of the Herbert D. Hall Foundation, a film was shown describing the history and development of aviation.

Low Temperature Welding Practice

Portland, Ore.—G. A. MacGillivray, Supervising Field Engineer, Eutectic Welding Alloys Company, New York City, spoke May 31 before a meeting of Portland Chapter held at the Imperial Hotel.

His subject, "Low Temperature Welding," included the theory and procedure used in this process, slides being employed to supplement his remarks.

"Inventions on Review," an interesting film accompanied by a coffee talk, was presented by John T. Anderson, Patent Co-ordinator.

Thread Rolling Aids Aircraft Industry

Syracuse, N.Y.—"Recent Advances in the Art of Thread Rolling" was the deeply interesting subject of a lecture by A. Bradford Reed, President of the Rolled Thread Die Company of Worcester, Mass., at the Syracuse Chapter meeting held June 12 at the Onondaga Hotel.

A. B. Reed

Mr. Reed has played a very prominent part in developing thread rolling and thread rolling machines to a point where rolling is now being employed to form threads with all degrees of precision, including the highest, on practically all forms of external threaded products at high rates of production.

The lecture, illustrated with slides, touched briefly on the history of thread rolling, and covered recent developments on the new type cylindrical die machines. These have made it possible to apply thread rolling to a very wide field, touching every industry requiring threaded fastenings of great variety and shapes, along with producing threads of a higher tensile strength than by any other method.

Among the many new applications, it was brought out that modern thread rolling had greatly contributed to the advancement of the aircraft industry which relies on thread rolling for a large percentage of its important fastenings.

Mr. Reed's address was followed by an open forum which developed a lively interest in technical detail on a great variety of applications.

"Jet Propulsion" Draws Large Attendance

Indianapolis, Ind.—The audience at the May 3 meeting of Indianapolis Chapter heard about "Jet Propulsion—What It Is and What It Isn't" from James Lane and Robert Russell, both of the Allison Division of General Motors Corporation.

Held in the Lincoln Hotel, the dinner meeting drew an attendance of approximately 300, indicating the popularity of the subject under discussion.

Education Chairman George Thomas reported on the ambitious National Education Program.

Ladies Entertained At Dinner Dance

Chicago, Ill.—Dancing to the syncopation provided by ASTE'er Lee Shaw and his orchestra, Chicago Chapter entertained their feminine guests, May 12, at the Second Annual Ladies Nite Informal Dinner Dance held in the Furniture Club of America.

A reception and dinner preceded the new and novel floor show, after which dancing was resumed by the capacity gathering of 450 persons.

Hydraulics Opens New Program Series

Grand Rapids, Mich.—R. E. Esch, Director of Tool Applications, Vickers, Inc., Detroit, explained the "Hydraulic Operation of Machines" to the 101 members and guests present at the meeting of Western Michigan Chapter held May 14 at the Rowe Hotel.

R. E. Esch

After speaking briefly on the origin of hydraulic machines, their development and operation, Mr. Esch presented slides illustrating various operations, discussing each in detail.

One of a series of sessions on machine development being planned by the Program Committee, this meeting will be followed by presentations concerning electrical applications in machine design, motors and electronics, ball bearing applications, lubrication, composite, basic machine design and elements of tool design.

Having enjoyed dinner at the Herman Fischer Hotel in Frankenmuth, Michigan, Flint Chapter happily anticipates address on gearing by Charles H. Stanard of Buick Motor Division, Flint, at May 24 meeting.

Field Likes Handbook Plan

When we originally wrote to educators and technical magazine editors for their opinions on a Handbook along lines very briefly outlined to them, we didn't make it easy for them to answer.

None of those question-begging surveys, cleverly phrased to invite only an easy and painless approval by just checking off a lot of little boxes.

All we asked for was "....any comments at all, that may occur to you."

—Which makes some of their thoughtful, detailed comments, listed below, really indicative of a strong and friendly interest in a project which they can appraise as a genuine contribution to industry and to education at large.

* * *

University of California: "I think you should make every effort to include all the *fundamental* knowledge that is available regarding metal forming."

* * *

Case School of Applied Science: "I was interested in the contents of this Handbook, and my only suggestion is that a section on 'research' on the 'Machinability of Materials' would, I think, be very useful and would tend to keep the Handbook more up to date by indicating directions of future progress."

* * *

Plastics: "It seems to me that you have covered all the data and information that the average tool designer and engineer would want to have. I am fully cognizant of the tremendous advance the industry has made in the war; that in and of itself confirms the great necessity for such a book."

* * *

Cornell University: "We have been watching with interest your progress in bringing out the *Tool Engineers' Handbook*. The tremendous field to be covered and the dearth of information on many of the subjects impresses us with the proportions of your undertaking. This handbook could readily be used in our tool design course and we will gladly give it due consideration on publication. We are glad to have the privilege of offering a few suggestions for your handbook:

1. "We believe that the subject headings could be better chosen by considering the fundamental process through which any piece of raw material progresses in becoming a finished product. The book would begin with product design and then follow through a logical sequence of the primary and secondary manufacturing processes and end up with inspection practice and final finishing operations.

2. "Under the above arrangement, one of the most important chapters in this book would be on 'materials.' This would include tooling materials, and manufacturing materials. As evidence of the importance of such information, we have just received an inquiry from an industrialist who asks 'What material should I use for this tool?' Your handbook should be able to help this man with his problem.

3. "Every book is limited in size and content, hence, your handbook cannot be expected to answer every problem. We are, therefore suggesting a 'bibliography' with each chapter as an aid for tracking down more detailed information on the subject material.

4. "Your Society has, in its publications, frequently considered plastics and their tooling. In view of the expected rapid advances in this industrial field, we feel certain that you will want to include a chapter on 'tools for plastic molding.'"

* * *

Mill & Factory: "Your outline, to me, seems to be pretty complete in covering a handbook of this type. The only thing that occurred to me was something on the proper method of sharpening tools; that is the correct rake and clearance angle for various types of tools and for using them with the different kinds of materials. Also something on the proper method of getting up a tool sharpening and reconditioning schedule based on production experience."

* * *

Aviation: "The outline of your proposed book sounds interesting. Here are a few thoughts about its contents.

"Properties of materials, both of the type worked and for tools and dies, certainly would be important—though available of course from other sources. There is no specific mention of inspection equipment or methods, although it may be covered under broader heads.

"Possibilities of dies and other tools made from Kirksite, plastics and other cast materials surely should be included under some heads already given or presumably contemplated.

"There may well be some mention of patterns, especially for casting production; of templates and methods of making and reproducing them; of lofting practices; the use of mock-ups and models and possibly something on drafting and reproduction of prints and the like."

Decentralization Tends To Greater Precision

Fond du Lac, Wis.—Present day methods of making interchangeable parts in widespread plants and assembling them at a central point makes imperative more accurate means of measurement, Adam Gabriel, Vice President of the Acme Industrial Company, Chicago, told Fond du Lac Chapter in meeting June 7 at Reif's Mills near Manitowoc.

Mr. Gabriel, in his discussion of "Light Waves and Their Uses in Precision Shop Measurements," described methods of making shop measurements to .000001 of an inch by using light waves and optical flats with master blocks. Slides were also shown illustrating various applications.

The approximately 125 members and guests from Fond du Lac and the Fox River Valley enjoyed a country-style dinner served by Rudy's Tavern before the meeting.

* * *

The May meeting, held on the 11th at Hotel Beaumont, Green Bay, featured C. J. Oxford, Chief Engineer, National Twist Drill Company, Rochester, Michigan. Mr. Oxford spoke on "Hobs and Hobbing Practices," augmenting his remarks with slides.

Reep Joins L. A. Firm

Los Angeles, Calif.—J. Don Reep, former District Manager of National Twist Drill & Tool Company in Buffalo, New York, has been appointed Vice President and Manager of Machinists' Tool & Supply Company of Los Angeles, which was organized as an industrial tool distributing firm in 1923.

J. Don Reep

Born in Pennsylvania, he was educated in military schools, including the Citadel in Charleston, S. C. He studied machine shop practice, management and tool engineering in Burma, India.

Mr. Reep followed the oil industry in various parts of the world for a number of years, finally settling down to plant supervision until joining the National Twist Drill & Tool Company. He remained with this Company for sixteen years in charge of sales and service for Western and Upper New York State. Previous to that, he was in Pittsburgh and the Eastern Central States in the same capacity. He brings broad experience in sales work and a thorough knowledge of tool engineering and manufacturing to Machinists' Tool & Supply Company.

Mr. Reep has been active in ASTE and the Society of American Military Engineers. A former National Director and National Standards Chairman, he organized and became the first chairman of the Buffalo-Niagara Frontier Chapter, ASTE, and was instrumental in the forming of other Chapters in upper New York State.

Automakers Delayed By Tool Holdup

Pontiac, Mich.—Conversion to peacetime production in the automotive industry was discussed by Harry J. Klingler, General Manager, Pontiac Motor Division, May 17, when he addressed Pontiac Chapter at the Pontiac Hotel.

H. J. Klinger

Relatively few cars can be made this year unless machine builders and tool makers are permitted to furnish the necessary equipment, the speaker warned. As a one-nation war will probably not require the entire productive force of our country, the resulting unemployment should be absorbed in partial reconversion to civilian manufacture, he indicated.

Mr. Klingler anticipates an adequate supply of steel, but he believes that copper, aluminum, bronze and upholstering might be difficult to secure. While the new cars will be similar to 1942 models, gradual changes will be effected. Full production may reach an all-time high of 6,000,000 vehicles a year, the speaker estimated.

Members and guests totalling 106 enjoyed the program which included the screening of a war newsreel and a military film entitled, "Rolling To The Rhine."

B-24's Seen at Willow Run Plant

Flint, Mich.—Approximately 40 members of Flint Chapter journeyed to Ypsilanti, May 27, for a three-hour escorted tour of the giant Ford Willow Run Bomber plant.

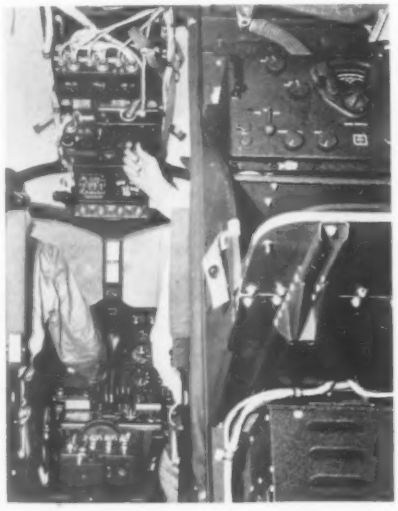
Amazement was expressed at the size of this mammoth aircraft project requiring 67 acres of buildings and a 2000-acre airport with six runways, one of which is 7,366 feet long. Concrete used in the installation would build 115 miles of 20-foot highway.

Since April of 1941 when ground was first broken, the huge plant has been erected, equipped and provided with express superhighways, turning out a record production of approximately 9,000 B-24's. Tooling, instrumental in effecting this achievement, included 30,000 dies and 18,000 fixtures. Powered by four big 1250 h.p. Pratt and Whitney engines, the bombers have a wingspread of 110 feet, a four-ton bomb capacity, and a speed of 300 miles per hour.

At the conclusion of the tour, the party was privileged to inspect the interior of one of the completed ships, entrance being made through a trap door in the rear of the fuselage.

Before leaving, the guests were entertained at dinner in the plant which has since completed its wartime role.

Looking forward from the radio deck of a B-24 at the instrument panel on the flight deck. Flint Chapter and other ASTE groups had the privilege of inspecting the interior of one of these ships during recent tours of the now-closed Ford Willow Run Bomber Plant.



High Speed Steel Treatment

Hamilton, Ont.—"High Speed Steel," an address by J. P. Gill, Vice-President, Vanadium-Alloys Steel Company, Latrobe, Pennsylvania, was presented by Dr. G. Roberts of the same company to the 59 members of Hamilton Chapter who gathered May 11 at the Royal Connaught Hotel.

Properties, effects of alloys, and the heat treating of high speed steels were included in the slide-illustrated lecture which was followed by a general discussion period.

National Assistant Secretary-Treasurer W. A. Dawson reported on the 1945 Annual Meeting at Detroit, covering various Society activities.

OBITUARIES

B. Joseph Riordan

B. Joseph Riordan, well known in the machine tool industry and to Michigan manufacturers, recently died suddenly.

Born in Boston, Massachusetts, he studied at Mechanic Arts High School and Lowell Institute and entered the machine tool industry with the Fellows Gear Shaper Company, Springfield, Vermont, in 1912. In 1915 he came to Michigan, engaging in the selling of machine tools the following year at Detroit.

B. J. Riordan

With his brother, John M., he founded the Riordan Machinery Company in 1933, acting as Vice-President up to the time of his passing. He was a member of the Detroit Chapter since 1938.

Former business connections included C. A. Strelinger Co., Bryant Chucking Grinder Co., Leland Gifford Co. and Cadillac Machinery Co.

* * *

John W. Ingram

The War Department recently announced notification by the former German government, through the International Red Cross, of the death of First Lieutenant John W. Ingram, 25, of Edon, Ohio, on May 24, 1944.

Previously reported missing on that date, Lieut. Ingram was killed in action over Berlin, the official dispatch stated. Prior to entering the service in August of 1942, he was employed as a tool designer at Air Associates, Inc., Los Angeles. Earlier industrial experience included tool designing at Goodyear Aircraft Corporation, Akron, Ohio, where he was affiliated with the local Chapter of ASTE.

A varsity baseball player and Kappa Delta Rho, Lieut. Ingram received his B.S. from Ohio State University where he was also granted a degree by the Engineering Defense Training School.

After training at Lubbock, Texas; Columbus, Ohio; and Rapid City, S. D.; he went overseas in April, 1944, being stationed with the Eighth Air Force in England. A month later he was awarded the Air Medal as pilot of a B-17.

* * *

G. Tell DuBois

G. Tell DuBois, 54, Michigan representative of Potter & Johnston Machine Company for the past 22 years, died recently of a heart attack at his home in Detroit.

G. Tell DuBois

Born in Switzerland, he came to this country at an early age, receiving his education at Torrington, Conn. An American citizen since 1915, Mr. DuBois was associated with a number of Michigan firms including Burroughs Adding Machine Company, Reliance Motors, Ford Motor Company, Mail-O-Meter Company and Eastern Production Company, before joining the staff of Potter & Johnston.

He had been affiliated with Detroit Chapter of ASTE since 1938.

William O. Vedoe

Falling victim to small arms fire, Pfc. William O. Vedoe, 22, was instantly killed while attacking enemy positions in Uttenhoffen, France, March 15, according to a War Department dispatch to his family.

W. O. Vedoe

Born and educated in Quincy, Massachusetts, Mr. Vedoe, a member of Boston Chapter, ASTE, was associated with Vedoe Peterson Company, Inc., as Assistant Foreman until entering the Army Air Corps in August of 1943. After training at Oklahoma Agricultural College, he was transferred to the Infantry at Camp Howze, Texas, where he received the Expert Infantry Badge.

Going overseas in September, 1944, with the 103rd Division of the Seventh Army, Pfc. Vedoe was wounded in action in France on November 25.

* * *

Wilson J. Tallman

Wilson J. Tallman, head of the National Tool & Machine Company, Rochester, N.Y., died May 10, just ten months to the day that his partner, Henry W. Maas, preceded him in death.

A native of Muncy, Pennsylvania, Mr. Tallman went to Rochester in 1908, organizing his company 23 years ago.

He was affiliated with Rochester Chapter, ASTE, and was President of the Tool, Die and Special Machine Association, Inc.

* * *

Albert C. Krause

Pfc. Albert C. Krause, infantry, was killed in action in Germany, March 15, at the age of 25.

Entering the service July 19, 1944, to receive basic training at Camp Hood, Texas, he went overseas January 1, 1945.

Pfc. Albert C. Krause

A graduate of Cass Technical High School, Detroit, he was previously employed as a Tool Designer at Pioneer Engineering and Manufacturing Company in that city.

Pfc. Krause, whose widow recently received his posthumously-awarded Purple Heart, had been affiliated with Detroit Chapter since August, 1942.

* * *

Fayette L. Schaefer

Fayette L. Schaefer, 48, of the Sales Service Machine Tool Company, succumbed recently at his home in Minneapolis, after a week's illness.

Born in Shakopee, Minnesota, Mr. Schaefer was educated at the University of Minnesota, subsequently becoming a mechanical engineer.

Recently appointed Standards Chairman of Twin Cities Chapter, ASTE, Mr. Schaefer was also a member of the Business and Professional Men's Club.

Keen Interest In Tool Steel Talk

Buffalo, N.Y.—One of the finest technical sessions which Buffalo-Niagara Frontier Chapter has been privileged to enjoy was held May 17 at the Markeen Hotel.

Lennert C. Grimshaw, Mill Metallurgist, Latrobe Steel Company, Latrobe, Pennsylvania, speaking on "Tool Steels," gave a clear and particularly informative talk, explaining the selection of steels for dies, hobs, and so forth, and the reasons therefor. The group took full advantage of the subsequent discussion period to present problems for solution by Mr. Grimshaw and Mr. Ray P. Kells, Chief Service Engineer of the same company.

Donald Hastie, Director of Sales Training for the Carborundum Company, Niagara Falls, New York, gave the coffee talk, taking as his subject, "Grinding Wheel Markings." Illustrating his remarks by means of a large board showing detailed markings, the speaker also distributed pamphlets describing marking identification.

Dinner was served to 75 members who were joined by an additional 29 at the meeting.

BUY MORE BONDS

Tool Company Hosts At Gun Plant Tour

Houston, Texas—As guests of the Hughes Tool Company, operators of the Dickson Gun Plant, 120 members of Houston Chapter were entertained May 8 with dinner in the company cafeteria and a subsequent tour of the plant.

J. H. Teer, General Manager of the plant, welcomed the group and introduced Major V. L. Packard, Ordnance Officer in charge, who gave a brief history of the armament installation.

Following a short but interesting coffee talk, "The Need For More Production Methods," given by C. H. Elliott, Master Mechanic of the Reed Roller Bit Company, Mr. Teer introduced the eight guides who conducted the group through the various departments.

Much interest was evidenced in the processes shown, including the centrifugal casting of large cannon and the machining and assembling of gun barrels and parts.

The firing of a primer for a 90 mm. cannon projectile concluded the tour.

ASTE Past President Walter F. Wagner, formerly Assistant General Superintendent of the Ford Willow Run Bomber Plant, tells Cleveland Chapter about tooling required for B-24 production, during May 11 meeting at the Cleveland Club.

At the speaker's table, left to right, are ASTE President C. V. Briner, First Vice Chairman R. E. Harrold, Mr. Wagner, Chairman J. I. Karash, National Editorial Chairman G. J. Hawkey, Treasurer H. E. Peiffer and Secretary W. J. Fitzsimmons.

Liberators Monument To Tooling

Cleveland, Ohio—Past President Walter F. Wagner, who served as Assistant General Superintendent of the immense Ford Willow Run Bomber Plant until its recent closing, addressed Cleveland Chapter's May 11 meeting at the Cleveland Club, explaining the tooling for the major aircraft enterprise.

Credit for the record production of one B-24 per hour in spite of the thousands of engineering changes, absorbed at the rate of 200 per day is due to the elaborate, specially-built fixtures, and the Ford-designed milling machine permitting many operations to be performed while the center wing, around which the Liberator is built, is held in one position, the speaker indicated.

Mr. Wagner, now in charge of the Tooling Center, Lincoln Motor Company, Detroit, also reviewed the Society's history, describing its growth from a small local group in 1932 to its present international stature.

President C. V. Briner, a Chapter member, discussed the Society's national activities, including the drafting of the revised Constitution now in the hands of the membership for vote.

The final dinner meeting of the season was attended by more than 150 members.

Absorbed in Past President Walter F. Wagner's revelation of the prodigious task of tooling the Ford Willow Run Bomber Plant, is a group of the more than 150 members who attended the May 11 meeting of Cleveland Chapter at the Cleveland Club.

Dinner guests of Hughes Tool Company, Houston Chapter members met May 8 for tour of Dickson Gun Plant.

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***1st Monday* ***

CHAIRMAN, JACOB D. SCHILLER
Bus. - Western Electric Co., 346 Claremont Ave., Jersey City, N.J.
Res. - 1440 E. 14th St., Brooklyn, N.Y.
Tels: - *Bus.* - Bergen 3-1616
Res. - Esplanade 6-0881

SECRETARY, A. H. TUTTLE, JR.
Bus. - Air Associates Inc., Teterboro, N. J.
Res. - 487 Valley Rd., Upper Montclair, N. J.
Tels: - *Bus.* - Hasbrouck Heights 8-1580
Res. - Montclair 2-6656-J

* Chapter Meets

HAMILTON *(ONT.)* No. 42
***2nd Friday* ***

CHAIRMAN, H. H. WHITEHALL
Bus. - Consulting and Experimental Engineers, P.O. Box 200, Hespeler, Ont., Can.
Res. - 15 Havill St., Galt, Ont.
Res. Tel: - 671

SECRETARY, JOHN E. BALL
Bus. - Otis-Fensom Elevator Co., Ltd., Victoria Ave. N., Hamilton, Ont., Can.
Res. - 1770 King St. E., Bartonville P.O., Hamilton, Ont., Can.
Tels: - *Bus.* - 7-9271
Res. - 4-9379

HARTFORD, No. 7 - *1st Monday* *

CHAIRMAN, G. A. HIGHBERG
Bus. - Cushman Chuck Co., 806 Windsor St., Hartford, Conn.
Res. - 14 Hickory Lane, West Hartford 7, Conn.
Tels: - *Bus.* - 7-0741
Res. - 32-1318

SECRETARY, M. L. MERRILL
Bus. - Melville L. Merrill Co., 410 Asylum St., Hartford, Conn.
Res. - Hunter Drive, W. Hartford, Conn.
Tels: - *Bus.* - 2-5741
Res. - 3-7219

HOUSTON, No. 29
***2nd or 3rd Tuesday* ***

CHAIRMAN, H. R. TURNER
Bus. - Hughes Tool Company, 300 Hughes St., P.O. Box 2539, Houston 11, Texas
Res. - 1418 Elliott, Houston 3, Texas
Tels: - *Bus.* - W-63101
Res. - W-5229

SECRETARY, L. P. ROBINSON
Bus. - Hughes Tool Company, 300 Hughes St., P.O. Box 2539, Houston 11, Texas
Res. - 4372 Ruth, Houston 4, Texas
Tels: - *Bus.* - W-63101
Res. - K-35158

INDIANAPOLIS, No. 37
***1st Thursday* ***

CHAIRMAN, HARRY L. BOESE
Bus. - Merz Engineering Co., 200 S. Harding St., Indianapolis 7, Ind.
Res. - 2619 E. 11th St., Indianapolis 1, Ind.
Tels: - *Bus.* - MA 7431
Res. - CH 7907

SECRETARY, DAVID R. SMITH
Bus. - Allison Div., G.M.C., Speedway City, Indianapolis 44, Ind.
Res. - 2208 Park Ave., No. 2, Indianapolis 5, Ind.
Tels: - *Bus.* - BE 3600, Ext. 8-512
Res - WA 8494

KANSAS CITY, No. 57
***1st Wednesday* ***

CHAIRMAN, H. ROBERT BROWN
Bus. - Aireon Mfg. Corp., Fairfax & Funston Rds., Kansas City, Kans.
Res. - 828 W. 72nd St., Kansas City, Mo.
Tels: - *Bus.* - AT 0772
Res. - HI 2278

SECRETARY, J. W. GALLAGHER
Bus. - Butler Manufacturing Co., 7400 E. 13th St., Kansas City 3, Mo.
Res. - 3415 Gillham Rd., Kansas City, Mo.
Tels: - *Bus.* - BE 7400
Res. - WE 1184

LOS ANGELES, No. 27
***2nd Thursday* ***

CHAIRMAN, ARTHUR D. LEWIS
Bus. - Nu-Vise Products Co., 4328 San Fernando Rd., Glendale 4, Calif.
Res. - 2500 Lorraine Rd., San Marino 9, Calif.
Tels: - *Bus.* - CH 5-1923
Res. - AT 4-5273

SECRETARY, R. G. STRONKS
Bus. - North American Aviation, Inc., Inglewood, Calif.
Res. - 4225 Irving Pl., Culver City, Calif.
Res. Tel: - AR 8-7622

LOUISVILLE, No. 54 - *2nd Tuesday* *

CHAIRMAN, JOHN THOMAS
Bus. - Westinghouse Electric Corp., Naval Ordnance Plant, Box 1860, Louisville, Ky.
Res. - 3017 Brownsboro Rd., Louisville, Ky.
Tels: - *Bus.* - FR 1741
Res. - TA 6535

SECRETARY, ANCIL BROWN
Bus. - American Radiator & Standard Sanitary Corp., Louisville, Ky.
Res. - 1823 Alfresco Place, Louisville 5, Ky.
Tels: - *Bus.* - Mag. 1888
Res. - Highland 4930-W

MILWAUKEE, No. 4 - *2nd Thursday* *

CHAIRMAN, A. R. GIERINGER
Bus. - A. R. Gieringer Tool & Mfg. Co., 3115 W. Cameron Ave., Milwaukee 9, Wis.
Res. - 3862 N. 53rd St., Milwaukee 10, Wis.
Tels: - *Bus.* - Hilltop 1920
Res. - Hopkins 9795-R

SECRETARY, RICHARD FORD
Bus. - Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.
Res. - Route 3, Box 562, Waukesha, Wis.
Tels: - *Bus.* - Greenfield 8300
Res. - Big Bend 230

(*MINNEAPOLIS - ST. PAUL*) TWIN CITIES, No. 11 - 2nd Wednesday *

CHAIRMAN, W. A. AHLBERG
Bus. - Brown & Bigelow, 1286 University Ave., St. Paul 4, Minn.
Res. - 1041 Jessie St., St. Paul, Minn.
Tels: - *Bus.* - Nestor 6331, Ext. 335
Res. - Tower 3454

SECRETARY, W. H. ERSKINE
Bus. - Ex-Cell-O Corp., Box 72, Traffic Station, Minneapolis 3, Minn.
Res. - 2371 Chilcombe Ave., St. Paul 8, Minnesota
Bus. and Res. Tel: - Midway 7992

(*MOLINE, ROCK ISLAND, DAVENPORT*) TRI-CITIES, No. 23
***1st Monday* ***

CHAIRMAN, A. L. GEIGER
Bus. - Voss Bros. Mfg. Co., Davenport, Iowa
Res. - 806 E. 13th St., Davenport, Iowa
Tels: - *Bus.* - 3-2756
Res. - 3-7316

SECRETARY, L. N. DAHLEN
Bus. - Reynolds Eng'g. Co., Rock Island, Ill.
Res. - 901 43rd St., Rock Island, Ill.
Tels: - *Bus.* - R.I. 192
Res. - R.I. 1887

MONTREAL, No. 50
***2nd Wednesday* ***

CHAIRMAN, G. A. ROGERS
Bus. - West Aeronautical Devices, Inc., 1079 Mountain St., Montreal, Quebec
Res. - 5894 Coolbrook Ave., Montreal, Quebec, Can.
Bus. Tel: - LA 9362

SECRETARY, M. M. HANNAFORD
Bus. - Williams & Wilson, Ltd., 544 Inspector St., Montreal, Quebec
Res. - 3829 Northcliffe Ave., N.D.G., Montreal, Quebec, Can.
Tels: - *Bus.* - MA 4591
Res. - DE 9092

MUNCIE, No. 70 - *2nd Wednesday* *

CHAIRMAN, JOHN D. ROVICK
Bus. - Michigan Tool Co., Box 1257 Muncie, Ind.
Res. - State Road 67 North, Muncie, Ind.
Tels: - *Bus.* - 2-9256
Res. - 2-4256

SECRETARY, J. C. RUTTER, JR.
Bus. - Interstate Machy. Tool & Eng'g. Albany, Ind.
Res. - 1412 Meeker Ave., Muncie, Ind.
Tels: - *Bus.* - 3391
Res. - 8265

NASHVILLE, No. 43 - *3rd Friday* *

CHAIRMAN, OTIS W. DRESSLAR
Bus. - Dresslar-White Co., 201 Woodland St., Nashville 6, Tenn.
Res. - Franklin Pike, Nashville, Tenn.
Tels: - *Bus.* - 6-3647
Res. - 8-0216

SECRETARY, C. B. CLEMETSON
Bus. - Tenn. Enamel Mfg. Co., 4104 Park Ave., Nashville 9, Tenn.
Res. - 307 Woodmont Circle, Nashville 5, Tenn.
Tels: - *Bus.* - 8-6651
Res. - 8-3420

(*NEWARK*) NORTHERN NEW JERSEY, No. 14 - *2nd Tuesday* *

CHAIRMAN, F. R. DELHAGEN
Bus. - Western Electric Co., Bayonne, N. J.
Res. - 17 Temple Pl., Irvington 11, N.J.
Tels: - *Bus.* - Bayonne 3-7000, Ext. 307
Res. - Essex 2-4167

SECRETARY, H. WILSON RYNO
Bus. - H. Wilson Ryno Co., 1060 Broad St., Newark 2, N. J.
Res. - 100 Gregory Ave., West Orange, N. J.
Tels: - *Bus.* - Mitchell 2-0208, 2-7985
Res. - Orange 2-0218

NEW HAVEN, No. 41
***2nd Thursday* ***

CHAIRMAN, JACK F. SARGENT
Bus. - R. Wallace & Son Co., Quinnipiac St., Wallingford, Conn.
Res. - 131 Church St., Wallingford, Conn.
Tels: - *Bus.* - 193
Res. - 153

SECRETARY, ALTON V. POLLARD
Bus. - American Brass Co., Liberty St. Plant, Ansonia, Conn.
Res. - 33 Judson Pl., Ansonia, Conn.
Tels: - *Bus.* - 264, Ext. 345
Res. - 236M

NEW ORLEANS, No. 60
***2nd Tuesday* ***

CHAIRMAN, EDWIN E. GRAF
Bus. - Higgins Aircraft Co., P.O. Box 32, New Orleans, La.
Res. - 3257 Belfort Ave., New Orleans 19, La.
Tels: - *Bus.* - Crescent 9911, Ext. 36
Res. - Crescent 2718

SECRETARY, A. W. BERNHART
Bus. - Higgins Engine Co., 521 Scott St., New Orleans 19, La.
Res. - 3218 St. Charles Ave., New Orleans 15, La.
Tels: - *Bus.* - AU 6601, Ext. 25
Res. - JA 6060

PEORIA, No. 31 - *1st Tuesday* *

CHAIRMAN, E. M. BERTSCHI
Bus. - Caterpillar Tractor Co., Peoria 8, Ill.
Res. - Eureka Knolls, Eureka, Ill.
Bus. Tel: - 42151, Ext. 553

SECRETARY, C. B. HARTSOCK
Bus. - Caterpillar Tractor Co., Peoria 8, Ill.
Res. - 135 Cooper St., Peoria 5, Ill.
Tels: - *Bus.* - 4-3151, Ext. 8454
Res. - 4-3246

PHILADELPHIA, No. 15
***3rd Thursday* ***

CHAIRMAN, JOHN W. NOBLE
Bus. - Wm. Sellers & Co., 1600 Hamilton St., Philadelphia 30, Pa.
Res. - 160 Cedarcroft Ave., Audubon, N. J.
Tels: - *Bus.* - Locust 6850, Ext. 77
Res. - Audubon 1524M

SECRETARY, W. W. CADY
Bus. - Robertson Mfg. Co., P.O. Box 828, Trenton 5, N. J.
Res. - 6310 Sherwood Rd., Overbrook, Philadelphia 31, Pa.
Tels: - *Bus.* - Morrisville, Pa. 7181
Res. - Trinity 4793

PHOENIX, No. 67 - *Last Thursday* *

CHAIRMAN, C. W. CLARKE
Bus. - AiResearch Mfg. Co., Sky Harbor Airport, Phoenix, Ariz.
Res. - 2214 N. Central Ave., Phoenix, Ariz.
Tels: - *Bus.* - 4-7271, Ext. 59
Res. - 3-6594

SECRETARY, JACK R. ROBINSON
Bus. - AiResearch Mfg. Co., Sky Harbor Airport, Phoenix, Ariz.
Res. - 518 West Palm Lane, Phoenix, Ariz.
Bus. Tel: - 4-7271

PITTSBURGH, No. 8 - *1st Friday* *

CHAIRMAN, C. E. J. BRICKNER
Bus. - Westinghouse Electric Corp., Room 5-G-47, East Pittsburgh, Pa.
Res. - 3485 Rosetta St., Munhall, Pa.
Tels: - *Bus.* - Brandywine 1500, Ext. 513
Res. - 3934

SECRETARY, W. S. RISSER
Bus. - Westinghouse Electric Corp., East Pittsburgh, Pa.
Res. - 1332 Franklin Ave., Wilkinsburg, Pa.
Tels: - *Bus.* - Brandywine 1500, Ext. 427
Res. - Churchill 2390

(*PORT ARTHUR-FORT WILLIAM, ONT., CAN.*) LAKEHEAD, No. 59
***1st Thursday* ***

CHAIRMAN, STUART SCORER
Bus. - Canadian Car & Foundry, Montreal St., Fort William, Ont.
Res. - 217 S. Marks St., Fort William, Ont., Can.
Tels: - *Bus.* - S. 1801
Res. - S. 3429

SECRETARY, DICK CROSS
Bus. - Canadian Car & Foundry, Montreal St., Fort William, Ont.
Res. - 311 E. Mary St., Fort William, Ont., Can.
Tels: - *Bus.* - S. 1801
Res. - S. 4772

PONTIAC, No. 69 - *3rd Thursday* *

CHAIRMAN, C. F. STAPLES
Bus. - Staple Engineering Co., 1315 S. Woodward, Birmingham, Mich.
Res. - 1366 Yosemite, Birmingham, Mich.
Tels: - *Bus.* - 3890, Detroit EL 5954
Res. - 3493-R

SECRETARY, GEORGE F. BRYAN
Bus. - GMC Truck & Coach, South Blvd., Pontiac 11, Mich.
Res. - 73 N. Anderson St., Pontiac 20, Mich.
Tels: - *Bus.* - 6111, Ext. 551
Res. - 2-2076

PORTLAND *(ME.)* No. 46
***3rd Friday* ***

CHAIRMAN, J. M. JOHNSTON
Bus. - Oxford Paper Co., Maine Coated Div., Rumford, Maine
Res. - 38 Urquhart St., Rumford, Me.
Tels: - *Bus.* - 1000
Res. - 611-M

SECRETARY, CHARLES E. PAIGE
Bus. - Edwards & Walker Co., Monument Square, Portland, Maine
Res. - 99 Maine Ave., Portland, Me.
Tels: - *Bus.* - 3-8151
Res. - 2-7889

PORTLAND *(ORE.)* No. 63
***3rd Thursday* ***

CHAIRMAN, RAYMOND E. NEILS
Bus. - Schmitt Steel Co., 2407 N.W. 28, Portland 10, Ore.
Res. - 7019 N. Vincent, Portland 3, Ore.
Tels: - *Bus.* - BE 5108
Res. - MU 3707

SECRETARY, JOHN R. BARRETT
Bus. - Moore Dry Kiln Co., P.O. Box 548, N. Portland, Ore.
Res. - Rt. 2, Box 160A, Troutdale, Ore.
Tels: - *Bus.* - UN 1681
Res. - Gresham 5121

* Chapter Meets

(PROVIDENCE) LITTLE RHODY, No. 53 - *3rd Wednesday* *

CHAIRMAN, JOSEPH F. McGOWAN
Bus. - McGowan Engineering Co., 486 Pawtucket Ave., Pawtucket, R. I.
Res. - 70 Scott St., Pawtucket, R. I.
Tels: - *Bus.* - Perry 9536
Res. - 2440

SECRETARY, J. H. WILLIAMS
Bus. - Taft-Peirce Mfg. Co., 44 Mechanics Ave., Woonsocket, R. I.
Res. - Mendon Rd., Ashton, R. I.
Bus. Tel: - Woonsocket 1

RACINE, No. 2 - *1st Monday* *

CHAIRMAN, R. M. GOODSELL
Bus. - Racine Plating Co., 538 4th St., Racine, Wis.
Res. - 3504 Washington Ave., Racine, Wis.
Tels: - *Bus.* - Prospect 1232
Res. - Prospect 2194

SECRETARY, GEORGE J. KLIMT
Bus. - Young Radiator Co., 709 S. Marquette St., Racine, Wis.
Res. - Route 5, Box 435, Waukesha, Wis.
Bus. Tel: - Jackson 342

RICHMOND, No. 66 - *2nd Tuesday* *

CHAIRMAN, R. E. LOCKRIDGE
Bus. - National Automatic Tool Co., Inc., S. 7th & N. Sts., Richmond, Ind.
Res. - 250 S.W. 1st St., Richmond, Ind.
Tels: - *Bus.* - 2833-2963, Ext. 26
Res. - 3629

SECRETARY, FLOYD T. SYKES
Bus. - International Harvester Co., N. 15th St. & Penn. Ry., Richmond, Ind.
Res. - 103 N. 16th St., Richmond, Ind.
Tels: - *Bus.* - 4645-5677, Ext. 13
Res. - 71093

ROCHESTER, No. 16
***As Announced* ***

CHAIRMAN, E. W. DeBISSCHOP
Bus. - Graflex, Inc., 154 Clarrissa St., Rochester, N. Y.
Res. - 241 Plymouth Ave. S., Rochester 8, N. Y.
Tels: - *Bus.* - Main 3131
Res. - Main 805-J

SECRETARY, D. F. KOHLER
Bus. - Genesee Mfg. Co., 141 N. Water St., Rochester 4, N. Y.
Res. - 9 Dorbeth Rd., Rochester 5, N.Y.
Tels: - *Bus.* - Stone 5496
Res. - Glenwood 3635-M

ROCKFORD, No. 12 - *1st Thursday* *

CHAIRMAN, WALTER R. LUSTIG
Bus. - Atwood Vacuum Mach. Co., 2500 N. Main St., Rockford, Ill.
Res. - 519 Pearl St., Rockford, Ill.
Tels: - *Bus.* - M 1673, Ext. 53
Res. - M 7913

SECRETARY, E. A. NORRMAN
Bus. - Woodward Governor Co., 5001 N. 2nd St., Rockford, Ill.
Res. - 1213 Revell Ave., Rockford, Ill.
Tels: - *Bus.* - P 600
Res. - M 6307

(ST. CATHARINES, ONT., CAN.) NIAGARA DISTRICT, No. 65
***3rd Friday* ***

CHAIRMAN, HENRY HENDRIKS
Bus. - Lightning Fastener Co., St. Catharines, Ontario, Can.
Res. - 126 Merritt St., St. Catharines, Ontario, Can.
Tels: - *Bus.* - 1329
Res. - 2485-W

SECRETARY, G. FREDERICK BUSH
Bus. - McKinnon Industries, St. Catharines, Ontario, Can.
Res. - 15 Elizabeth, St. Catharines, Ontario, Can.
Tels: - *Bus.* - 4646, Ext. 250
Res. - 782-R

ST. LOUIS, No. 17 - *1st Thursday* *

CHAIRMAN, W. G. EHRHARDT
Bus. - Ehrhardt Tool & Mach. Co., 914 Monroe St., St. Louis 6, Mo.
Res. - 7327 Winchester Dr., St. Louis 21, Mo.
Tels: - *Bus.* - Central 5350
Res. - Evergreen 0637

SECRETARY, R. W. BOEHLOW
Bus. - Carter Carburetor Corp., 2840 N. Spring Ave., St. Louis 7, Mo.
Res. - 1418 Salerno Dr., St. Louis County 14, Mo.
Tels: - *Bus.* - Newstead 2950
Res. - Delmar 4521

SAN DIEGO, No. 44 - *2nd Friday* *

CHAIRMAN, W. F. ASMUS
Bus. - Consolidated-Vultee Aircraft Corp., 3302 Pacific Blvd., San Diego 12, Calif.
Res. - 2905 Bancroft St., San Diego 4, Calif.
Tels: - *Bus.* - W-6611, Ext. 1584
Res. - Talbot 8543

SECRETARY, JEROME J. GROFF
Bus. - Consolidated-Vultee Aircraft Corp., Lindberg Field, San Diego 12, Calif.
Res. - 4979½ W. Pt. Loma Blvd., San Diego 7, Calif.
Bus. Tel: - W-6611, Ext. 1139

(SAN FRANCISCO) GOLDEN GATE, No. 28 - *2nd Tuesday* *

CHAIRMAN, LOUIS A. TALAMINI
Bus. - Friden Calculating Mach. Co., 2350 Washington Ave., San Leandro, Calif.
Res. - 2518 64th Ave., Oakland, Calif.
Tels: - *Bus.* - SW 0700, Ext. 13
Res. - SW 2560

SECRETARY, E. C. HOLDEN
Bus. - U.S. Naval Air Station, Alameda, Calif.
Res. - 3122 Guido St., Oakland 2, Calif.
Tels: - *Bus.* - LA 3-2200
Res. - KE 3-4590

SCHENECTADY, No. 20
***2nd Thursday* ***

CHAIRMAN, E. H. GIRARDOT
Bus. - General Electric Co., 1 River Road, Bldg. 48-2, Schenectady 5, N. Y.
Res. - 1238 3rd Ave., Schenectady 3, N. Y.
Tels: - *Bus.* - 4-2211, Ext. 4681
Res. - 6-1496

SECRETARY, N. Y. COXE
Bus. - General Electric Co., 1 River Road, Bldg. 41-209, Schenectady 5, N. Y.
Res. - Cayuga Rd., Box 433, R.D. 1, Schenectady, N. Y.
Tels: - *Bus.* - 4-2211, Ext. 4597
Res. - 4-6662

SEATTLE, No. 39 - *2nd Tuesday* *

CHAIRMAN, A. G. MEANS, JR.
Bus. - Boeing Plant 2, Seattle, Wash.
Res. - 96 S.E. Place, Mercer Island, Seattle, Wash.
Tels: - *Bus.* - RA 0800, Ext. 366
Res. - AD 5337

SECRETARY, K. BERGERSON
Bus. - Boeing Renton Plant, Renton, Wash.
Res. - 7749 20th N.E., Seattle, Wash.
Tels: - *Bus.* - LA 4000, Ext. 6218
Res. - KE 8582

SOUTH BEND, No. 30
***2nd Tuesday* ***

CHAIRMAN, P. W. WINKELMANN
Bus. - The Winkelmann Co., 1702 W. Washington Ave., S. Bend 21, Ind.
Res. - 1260 Woodward Ave., South Bend 16, Ind.
Tels: - *Bus.* - 2-4411
Res. - 4-6920

SECRETARY, JAMES L. KEMP
Bus. - Sibley Mach. & Foundry Corp., 206 E. Tutt St., S. Bend 23, Ind.
Res. - 909 Sherman Ave., South Bend 16, Ind.
Tels: - *Bus.* - 3-6145
Res. - 2-2702

SPRINGFIELD, (ILL.) No. 64
***1st Tuesday* ***

CHAIRMAN, J. V. JAVORSKY
Bus. - Allis-Chalmers Mfg. Co., 10th & Stanford, Springfield, Ill.
Res. - 1401 Lowell Ave., Springfield, Ill.
Tels: - *Bus.* - 2-9641, Ext. 244
Res. - 3-5309

SECRETARY, L. T. KRAUS
Bus. - Allis-Chalmers Mfg. Co., 10th & Stanford, Springfield, Ill.
Res. - 1520 W. Cook, Springfield, Ill.
Tels: - *Bus.* - 2-9641, Ext. 244
Res. - 2-8918

SPRINGFIELD (MASS.) No. 32
***2nd Monday* ***

CHAIRMAN, EDWARD J. STONE
Bus. - Westinghouse Electric Corp., 653 Page Blvd., E. Springfield, Mass.
Res. - 138 Dartmouth Terrace, Springfield, Mass.
Tels: - *Bus.* - 4-6431
Res. - 3-7928

SECRETARY, OWEN C. STEVENS
Bus. - Stedfast & Roulston, Inc., P.O. Box 596, Springfield, Mass.
Res. - 36 Brittany Rd., Longmeadow 8, Mass.
Res. Tel: - 3-1088

(SPRINGFIELD, VT.) TWIN STATES, No. 40 - *2nd Wednesday* *

CHAIRMAN, GEORGE R. MORIN
Bus. - Jones & Lamson Mach. Co., 160 Clinton St., Springfield, Vt.
Res. - 31 Woolson Ave., Springfield, Vt.
Tels: - *Bus.* - 321
Res. - 417-W

SECRETARY, WM. C. HADFIELD
Bus. - Fellows Gear Shaper Co., Springfield, Vt.
Res. - 33 Pine St., Springfield, Vt.
Tels: - *Bus.* - 26
Res. - 118-W

SYRACUSE, No. 19 - *1st Tuesday* * *after 2nd Monday*

CHAIRMAN, EMIEL J. FLORING
Bus. - Syracuse Supply Co., 314 W. Fayette St., Syracuse 1, N. Y.
Res. - 208 Briarcliff Rd., R.D. 3, East Syracuse, N. Y.
Tels: - *Bus.* - 2-9231
Res. - 4-3054

SECRETARY, LESTER H. COLLINS
Bus. - Carrier Corp., 300 S. Geddes, Syracuse 1, N. Y.
Res. - 177 Ridgeway Ave., Syracuse 3, N. Y.
Tels: - *Bus.* - 6-3161
Res. - 6-5938

TOLEDO, No. 9 - *2nd Wednesday*

CHAIRMAN, S. W. BURGESS
Bus. - Electric Auto-Lite Co., Champlain St., Toledo 1, Ohio
Res. - 915 Keil Rd., Toledo 7, O.
Tels: - *Bus.* - AD 3131, Ext. 140
Res. - JO 1369

SECRETARY, ROY J. DUSSEAU
Bus. - Northern Aircraft Products, 14th & Adams, Toledo 2, Ohio
Res. - 3926 Doty Dr., Toledo 6, O.
Tels: - *Bus.* - Garfield 4911
Res. - Kingswood 1535

TORONTO, No. 26 - *2nd Monday* *

CHAIRMAN, R. ERIC CRAWFORD
Bus. - Canadian Mach. & Mfg. News, 481 University Ave., Toronto 2, Ont., Can.
Res. - 4 Norma Crescent, Toronto 9, Ont., Can.
Tels: - *Bus.* - AD 9131, Ext. 123
Res. - LY 8807

SECRETARY, JOHN B. BURK
Bus. - Railway & Power Eng'g. Co., Ltd., 171 Eastern Ave., Toronto, Ont., Can.
Res. - 8 Laxton Ave., Toronto 3, Ont., Can.
Tels: - *Bus.* - Elgin 8301
Res. - Lakeside 3785

(WASHINGTON, D. C.) POTOMAC, No. 48 - *1st Thursday* *

CHAIRMAN, L. DIDSZONEIT
Bus. - Naval Torpedo Station, King St., Alexandria, Va.
Res. - 511 Woodland Terrace, Jeff. Pk., Alexandria, Va.
Tels: - *Bus.* - TE 2200, Ext. 123
Res. - AL 4250

SECRETARY, D. T. HILLEARY
Bus. - Naval Torpedo Station, King St., Alexandria, Va.
Res. - 116 N. Highland St., Arlington, Va.
Tels: - *Bus.* - TE 2200, Ext. 130
Res. - OX 2398

WICHITA, No. 52 - *2nd Tuesday* *

CHAIRMAN, HARRY GIWOSKY
Bus. - Boeing Airplane Co., Wichita 1, Kansas
Res. - 547 S. Crestway, Wichita 9, Kansas
Tels: - *Bus.* - 6-6611, Ext. 883
Res. - 3-5118

SECRETARY, L. R. GLASSBURNER
Bus. - Beech Aircraft Corp., Wichita 1, Kansas
Res. - R.F.D. 4, Box 127, Wichita, Kansas
Bus. Tel: - 6-4681

WILLIAMSPORT, No. 49
***2nd Monday* ***

CHAIRMAN, J. H. SHAFER
Bus. - Darling Valve & Mfg. Co., Ft. Walnut St., Williamsport 28, Pa.
Res. - R.D. 1, Cogan Station, Pa.
Tels: - *Bus.* - 6-124
Res. - Loyalsock 19-R-21

SECRETARY, STANLEY BARENDT
Bus. - Aviation Corporation, 1515 Park Ave., Williamsport, Pa.
Res. - Oliver St., Ext., Jersey Shore, Pa.
Res. Tel: - 113-R

WINDSOR, No. 55 - *2nd Monday* *

CHAIRMAN, CECIL G. SAMPSON
Bus. - Ford Motor Co., Sandwich St., Windsor, Ont., Can.
Res. - 2372 Windermere, Windsor, Ont., Can.
Tels: - *Bus.* - 3-6331, Ext. 757
Res. - 3-8547

SECRETARY, P. O. HARRISON
Bus. - Canadian Fairbanks-Morse, 357 Pitt St. E., Windsor, Ont., Can.
Res. - 1973 Verdun, Windsor, Ont.
Tels: - *Bus.* - 3-5293
Res. - 4-2771

WORCESTER, No. 25 - *1st Tuesday* *

CHAIRMAN, F. WM. McQUESTON
Bus. - Charles G. Allen Co., Barre, Mass.
Res. - Union St., Barre, Mass.
Tels: - *Bus.* - 10
Res. - 192-11

SECRETARY, C. D. SCHOFIELD
Bus. - Norton Company, 1 New Bond St., Worcester 6, Mass.
Res. - 150 W. Mountain St., Worcester 6, Mass.
Tels: - *Bus.* - 2-4641, Ext. 201
Res. - 3-4867

(YORK) CENTRAL PENNSYLVANIA, No. 22 - *2nd Tuesday* *

CHAIRMAN, P. A. RICKRODE
Bus. - York Safe & Lock Co., P.O. Box 1512, York, Pa.
Res. - R.D. 1, Abbotstown, Pa.
Bus. Tel: - 5551, Ext. 15

SECRETARY, CAREY E. NOEL
Bus. - York Corp., P.O. Box 1592, York, Pa.
Res. - R.D. 2, McDonald Heights, York, Pa.
Tels: - *Bus* - 5401, Ext. 331
Res. - 63-005

* Chapter Meets

THE PX

938th Ord. HAM Co.
APO 408 c/o Postmaster
New York, N.Y.

Dear Sir:

I am writing to thank you for the servicemen's membership card.

You and I know that the production that has been attained in these war years would never have been possible, if it weren't for the tools behind the scenes and the hours of thought and planning that went into those tools. My only hope is that I can do a fraction as much here for the war effort as I did on the tooling program for war production!

The Handbook you are planning to put out will be ideal and will meet many needs of the Tool Engineer. Send me any literature that you have—I read The Tool Engineer from cover to cover.

Yours truly,
Pfc. Gordon S. Turnage
Detroit Chapter

* * *

2308 Delancey Place
Philadelphia 3, Pa.

Gentlemen:

You might be interested in knowing that the army has finally found some use for my technical experience and training. Stationed at the Frankford Arsenal in Philadelphia, I now carry an army classification as a Metallurgist and am assigned to the research laboratories at the arsenal, working on heat-treating and tool problems.

O. P. Metcalf, Jr.

So that you may see how an ASTE'er looks in uniform, I am enclosing a photograph which was taken recently.

Let's hope the mess will be over soon and we shall be back to a normal way of living. In the meantime, may I extend best wishes for your continued service to industry and to the war effort.

Yours very truly,
Orlando P. Metcalf, Jr.
Private, Ordnance Department
At Large Member

* * *

J-44049
R.C.A.F., L.P.B.
Dartmouth, N.S., Canada

Dear Sir: I'd like to take the opportunity to thank the Society for its impartial service to all members—Armed Service or Civilian.

I take pride in being a member of our unique and growing Society. The ASTE, based on friendship rather than salesmanship, has made a noteworthy record during the past twelve years in promoting co-operation and good will among industries. This, I am sure, will have no small effect on post war reconversion.

The Tool Engineer and the Data Sheet revisions have been arriving faithfully, and I'd like to extend my sincere thanks for your generosity. Not only is my appreciation sent, but also that of our Squadron Engineering Officer and other personnel with whom I share our publication.

Sincerely,
Flying Officer C. A. Geddes
Hamilton Chapter

Class 44-43
Student Sqdn. III
LVAAF
Las Vegas, Nevada

Gentlemen:

I am happy to hear that our organization has made provision for those members in the armed services.

When this war is won, our associates can turn their talents to the production of goods of peace and prosperity rather than to implements of war and destruction.

It is my hope that we might so contribute to the mass production of goods that all peoples might have the necessary things in life.

Our organization can be, if properly applied, a great force for progress and for good in the world after the end of the war. It is my hope that it will be. "Where there is no vision the people perish."

Sincerely yours,
Pvt. Edward S. Shannonhouse
ASN 42142847
Atlanta Chapter

* * *

279th Ord. Maint. (AA)
APO 230 c/o Postmaster
New York, New York

Hello Mr. Barnett:

Through you, as Public Relations Chairman for Rochester Chapter, I'd like to take this opportunity to say "hello" to all my friends in the organization, from whom I have been away for more than two years, over one and a quarter of which has been overseas. I've been in England, France, Belgium, Holland, Luxembourg, and Germany. Time goes pretty fast over here when we keep busy.

Paris is quite a "town" but there's still no place over here that can compare with the States and here's hoping it's not too long till I'm with you again.

Sincerely yours,
Fred Buehler
ASN 32734761
Rochester Chapter

* * *

[EDITOR'S NOTE: The address of George R. Widney, S 1/c, was inadvertently omitted, by the printer, from his communication published in this column last month. Letters may be addressed to Seaman Widney of Los Angeles Chapter, as follows: NTS Adv. FC, Ft. Lauderdale Beach Hotel, Ft. Lauderdale, Fla.]

New Magnetic Holding Methods Demonstrated

New Haven, Conn.—A progressive meeting was held by New Haven Chapter on May 10, beginning with dinner at George and Harry's Restaurant, continuing with a technical session at the Y.M.C.A., and concluding with an exhibit of cast cobalt tools, and buffet lunch, at the Crucible Steel Company.

Ray Brown of Rockford Magnetic Products Company, Rockford, Illinois, was the technical speaker, explaining "Power Grip—The Revolutionary Method of Magnetic Holding." Mr. Brown demonstrated, with the aid of actual units, setups for various kinds of magnetic holding.

Production Executive For Pitney-Bowes

Stamford, Conn.—Byrom Judson Smith, former production executive with the Lycoming Division of The Aviation Corporation and the Marmon-Herrington Company, has been appointed Chief Production Engineer of Pitney-Bowes Postage Meter Co., according to an announcement by John H. Pratt, Jr., Vice-President in Charge of Manufacturing.

B. J. Smith

A native of Indianapolis, he served as production engineering co-ordinator of the Rolls-Royce Merlin engine program at Lycoming in Williamsport, Pennsylvania, from July, 1943, to the present. From 1941 to 1943 he was director of production planning at Marmon-Herrington in Indianapolis, specializing in the engineering and manufacturing of the T-9E1 airborne combat tank, carried by gliders in the Normandy invasion.

He formerly held production and engineering posts with Fairbanks-Morse Company, Allison Engineering Company, Noblitt-Sparks Industries, Inc., and other midwest manufacturing concerns.

A member of Williamsport Chapter, ASTE, Mr. Smith was formerly affiliated with Indianapolis Chapter. He is also a member of SAE.

Aviation Official Tells Postwar Plans

Providence, R. I.—An interesting non-technical program was presented by Little Rhody Chapter, meeting May 16 at Oates Tavern.

Possibilities in the "Expansion of Commercial Aviation in New England" were discussed by W. Brown of Northeast Airlines, Logan International Airport, East Boston, who outlined postwar plans for extension of airline service.

Duplication Methods For Reconversion

Fort Wayne, Ind.—Approximately 85 members and guests attended the June 13 meeting of Fort Wayne Chapter at the Chamber of Commerce, when Elton Miottel, Customer Research Engineer of the George Gorton Machine Company, Racine, Wisconsin, spoke on "Tracer-Controlled Duplication" and its relation to post-war reconversion of dies and molds. His talk was well illustrated by a color-sound film, "An Exact Duplicate."

Elton Miottel

An added and timely attraction for local nimrods was the color film, "Fishing In Minnesota," shown by Member Paul E. Waugh of The Tokheim Oil Tank & Pump Co. This meeting concluded the activities of the group until September.

Ammunition Production

Toronto, Ont. — "Mass Production Technique As Applied To Ammunition Production" was the subject of the May 14 technical session held at the Economics Building, University of Toronto, by Toronto Chapter.

Guest speaker was Kimble Finkenstaedt, Vice-President of W. F. and John Barnes Company, Rockford, Illinois, whose excellent presentation was thoroughly enjoyed by the ninety members and guests in attendance.

The film, "They Didn't Know," supplemented his address, while "Sightseeing At Home," a sound production describing the principles of television, was shown through the courtesy of the Canadian General Electric Company.

San Diego Program Chairman Paul Whitmoyer introduced Dr. A. O. Schmidt of Kearney & Trecker Corporation, Milwaukee, a recent technical speaker.

Photo shows, left to right, Dr. Schmidt, W. H. Stancil, AAF, also a speaker; Mr. Whitmoyer and Secretary J. J. Groff.

Jasper Inducts New Officers

New Orleans, La.—Guest of honor, when New Orleans Chapter met May 8 at the St. Charles Hotel, was Regional Director Col. Kenneth C. Jasper of Louisville, Kentucky, who installed the recently-elected officers.

After reviewing the Society's history, aims and activities, and instructing them concerning the performance of their duties, Director Jasper administered the oath of office to: Chairman Edwin E. Graf, Chief Tool Designer, Higgins Aircraft Co.; 1st Vice Chairman John G. Unverzagt, Tool Engineer; Secretary A. W. Bernhart, Chief Draftsman; Treasurer Wayne F. Scott, Chief Tool Engineer, Higgins Engine Co.; 2nd Vice Chairman M. J. Bayhi, Production Mgr., National Blow Pipe & Mfg. Co.

The group plans to continue its meetings through the summer.

Regional Director Kenneth C. Jasper advises New Orleans Chapter Officers concerning their duties and responsibilities.

Shown here are, left to right, (seated) Director Jasper and Chairman Edwin E. Graf; (standing) Second Vice Chairman M. J. Bayhi, Secretary A. W. Bernhart, and First Vice Chairman John G. Unverzagt.

Not included in the picture is Treasurer Wayne Scott.

Forum On Cold Treating Of Steel

Akron, Ohio—Forty-six members and guests of Akron Chapter met May 17 at Mayflower Hotel to hear Fred Whitcomb of Motor Products Corporation, Chicago, discuss "Deepfreeze and Its Application To Industry."

Mr. Whitcomb, who is very well versed on the cold treating of steels for both production and tool applications, answered many questions from the floor at the conclusion of his talk, being assisted on industrial problems by R. B. Pfister, Erwin Maus, Jr., Clair Jack and Gene Hampton.

Recent Advances In Carbide Milling

San Diego, Calif.—Featured attraction for San Diego Chapter's May 11 meeting at the San Diego Women's Club was Dr. A. O. Schmidt, Director of Metal Cutting Research, Kearney & Trecker Corporation, Milwaukee, Wisconsin.

A well-known author and traveler, Dr. Schmidt reviewed "Recent Developments in Milling Alloy Steels with Carbide Cutters." He revealed an interesting method of determining the amount of horsepower that the test specimens absorbed, the test samples and cutters being completely enclosed in a container with 100 c.c. of water. By taking before and after temperature readings of the water, results were found to be consistently accurate to within plus or minus 3%, on the horsepower absorption.

The speaker presented motion pictures showing applications of carbide milling of steel forgings, and slides pointing out the difficulties encountered when carbide tools are used at too high speeds.

After the lecture, questions on the problems of carbide steel milling were invited.

W. H. Stancil, Engineering Inspection and Liaison Co-ordinator, AAF, spoke on the vast strides made by the Aviation industry, commenting that "good airplanes require good tools." He predicted that jet and rocket propulsion would remove the limitations imposed by the reciprocating engine.

Reporting interestingly on a recent visit to San Francisco, Serge J. Bush, a member, told of his success in gaining admittance to the World Security Conference where he heard and spoke with some of the delegates. He also related the ease with which he secured a new position in that city, through Golden Gate Chapter, after previous disappointments through his own contacts.

"Desert Trails," filmed by Chester B. Wohler during his trips to Imperial Valley, completed a well-rounded program thoroughly enjoyed by the 116 members and guests.

BUY MORE BONDS

ASTE Vice President W. B. Peirce hears about plans for future activities of Philadelphia Chapter from Progress Chairman Thomas J. Donovan, Jr., who recently retired as Chapter Chairman. Mr. Peirce visited the group to explain proposed changes in Constitution.

At speaker's table, left to right, are Messrs. Donovan and Peirce, Elton Miottel of George Gorton Machine Company, Racine, technical speaker; and Chairman John W. Noble.

ASTE Talent Seen At Spring Frolic

Philadelphia, Pa. — Concluding the season's program, 225 Philadelphia Chapter members enjoyed an evening's entertainment May 17 when they participated in the ASTE Spring Frolic at the Engineers Club of Philadelphia.

Following dinner, a unique program, sponsored by the Donovan Company, was presented by Past Chairman Thomas J. Donovan, Jr., who conducted a "quiz" contest, interspersing general questions with technical interrogations. Winners were rewarded with prizes ranging from 11 to 21 cents in white pennies.

Creating intense interest among the entire gathering, the Chapter looks forward to a repeat performance of the stunt which Mr. Donovan has volunteered to put on for other ASTE groups.

"Ned" Glenn, "Magnanimous Master of Madness," mc'ed the 8-act floor show opened by ASTE'er Andy McMillan's band, Andy singing "Don't Squeeze The Banana."

Hub Group Has Play Day

Boston, Mass.—Casting aside their professional problems, 150 members and friends of Boston Chapter hied themselves to the United Shoe Machinery Country Club in Beverly, June 9, for a day of relaxation.

Bowling, horseshoes, tennis, golf, and bowling on the green—a novel experience for many—were enjoyed by the group, prizes being awarded for all competitive events.

The hearty dinner, served by a local caterer, and the six acts of entertainment which followed, were all enthusiastically received.

* * *

Charles I. Kraus, Director of Industrial Development for the Alemite Div., Stewart Warner Corp., Chicago, Ill., delivered an outstanding lecture on "Centralized Lubrication" at the May 10 meeting in Schrafft's Restaurant.

Describing the importance of the proper organization of lubricant maintenance service throughout industrial plants and the value of coded lubricants, Mr. Kraus showed in slides actual applications of proper and improper lubrication. With the introduction of the term, "Lubrichaos," many cost figures were quoted, proving the value of planned lubrication.

The speaker, who brought with him a ton of display material including many Lucite models, made actual demonstrations of four different applications of centralized lubrication, designed to make the system automatic with consequent elimination of the human element.

Profoundly impressed, the audience tarried late to ask for more information.

The technical session was preceded by dinner, during which music was furnished by Members Seth Barraclough and Kenneth Douglas, and a gadget talk was given A. J. Leone of the Chelsea Clock Company of that city.

Mr. Leone presented slides demonstrating an assembly fixture which locates both plates of a clock in such position as to control the tolerance on gear centers. Producing uniformly accurate work by unskilled help, with 43% increase in production, the operation originally required skilled workmen.

Sheet Metal Expert Describes Tooling

York, Pa.—Central Pennsylvania Chapter was fortunate in having Peter F. Rossman, General Manager, Curtiss-Wright Corporation, Development Division, Bloomfield, New Jersey, as technical speaker for its June 12 meeting at Bierman's Restaurant.

Mr. Rossman, who is well-known for his talks on "Sheet Metal Stamping and Forming," covered in a clear and concise manner the use of stainless and aluminum sheet metal, and die castings, in production, using 80 slides, showing various dies and special tools, to illustrate results obtainable through economical and progressive tool design.

Martin W. Kotarba, Works Manager, Chisholm-Ryder Company, Inc., Niagara Falls, New York, gave an inspirational talk on "The Future of ASTE," outlining the Society's history, activities, and future plans in the educational field.

An attendance of 65 was present for the dinner meeting.

ASTE'ers Welcome Ordnance Officers At Sheffield Demonstration

During the observance of Army Ordnance Day, high-ranking officers, together with officials of the Cincinnati Post, Army Ordnance Association, recently visited The Sheffield Corporation, Dayton, Ohio, to witness a demonstration of the latest developments in gages, precision instruments and machine tools.

Part of the group, shown below, are (left to right): Louis Polk, President, The Sheffield Corporation; Brigadier General Donald Armstrong, Commandant, Army Industrial College; L. W. Scott Alter, President, American Tool Works Company; Major General C. T. Harris, Commandant, Aberdeen Proving Ground; Ralph Lilleberg, Gage Distribution Manager of Sheffield; Colonel Thomas Jervey, Ordnance Officer of Wright Field, Dayton.

ASTE'ers Polk and Lilleberg, well-known in the Society and in industry, are both affiliated with Dayton Chapter.

Authors Textbook On Drill Jig Design

Cleveland, Ohio—"Analysis of Drill Jig Design," a recent McGraw-Hill publication, represents another ASTE contribution to the metal-working "know-how."

J. I. Karash

The work of J. I. Karash, Plant Engineer, Reliance Electric & Engineering Company, and Chairman of Cleveland Chapter, the book is built around the actual problems of drill jig design, for illustrative purposes, permitting adaptation to a wide latitude of tool design problems.

Its treatment is unique in that the drill jig is considered not as a whole, but as a definite number of related problems to be solved in a predetermined order. By following this method, unnecessary steps are eliminated, each solution contributing to the solving of succeeding problems.

Chapter headings in the 325-page, well-illustrated volume include Outline of Design Practice, Gathering Information, Analysis of Drilling Operations, Division-of-work Decision, Machine Decision, Principles of Locating, Clamping, Secondary-operation Jig Features, Positioning Features, Chip Control, Principles of Interchangeability, and Justification.

Mr. Karash's present office as head of the local Chapter, ASTE, was preceded by service as Second and First Vice Chairman, successively.

Gaging For Precision Manufacturing

Hartford, Conn.—In their technical discussion of "Dimensional Control," May 7, Ralph Lilleberg and Lou Lingler of the Sheffield Corporation, Dayton, Ohio, gave Hartford Chapter a thorough explanation of gaging methods.

Descriptions of the machine equipment, tooling and gaging methods, together with practical demonstrations, afforded a better insight into gaging practices, particularly with the air-operated type of gages. The ensuing question period was conducted at the demonstration display.

R. E. Lilleberg

Lou Lingler

Technical Chairman William Wilt, also of the Sheffield Corporation, presented the speakers in his introductory address.

Dinner, at the City Club, was served to 145, attendance rising to 254 for the technical session in the Hartford Gas Company Auditorium.

George Lohr, newly-appointed Chief Engineer of the Kellett Autogiro Corp., Philadelphia, is welcomed to membership in local Chapter.

A charter member of Boston Chapter, and more recently affiliated with the Buffalo Niagara-Frontier group, Mr. Lohr has transferred to Chapter 15.

At right is Arthur R. Diamond, Standards Committee Chairman, Philadelphia Chapter.

Tool Engineer Must Be Versatile

Dayton, Ohio—The tact of a diplomat, the wisdom of Minerva, and a working knowledge of Houdini's techniques will be needed by the postwar Tool Engineer, according to Louis Polk, President of the Sheffield Corporation and guest speaker at the Seventh Anniversary Dinner of Dayton Chapter held May 14 at the Miami Hotel.

Louis Polk

In developing his theme, "What Does Management Expect of the Tool Engineer During the Postwar Period?", Mr. Polk consulted leading manufacturers in this area, his address constituting a composite of local industry opinion.

Most manufacturers, in their retooling plans, expect the Tool Engineer to keep his company abreast of the latest developments in metals and metal-working, as well as in new heat treating processes. At the same time he must serve as a liaison officer between engineering, inspection, production, and sales, making himself receptive to others' ideas for incorporation into his recommendations of machine tools and methods.

In closing, Mr. Polk reminded his listeners that they must keep their feet solidly planted on the foundation of fact and knowledge gained from past experience, while giving their imaginations free rein in exploring the possibilities opened up by new developments.

The speaker's skillful handling of a difficult subject retained the interest of his audience throughout his presentation.

Mr. C. B. Nellis of the Inland Manufacturing Company talked briefly on 'Wages Versus Prices In The Postwar World." He expressed the opinion that if Tool Engineers produce as well in peacetime as they have in the war program, manufacturing will be expedited, costs lowered, and wages continued at present levels, with a fair return on investment for industry.

Included among the 80 in attendance were 12 charter members and all Past Chairmen.

The anniversary festivities opened with a dinner and entertainment by the "Aristocratic Trio."

Air Operated Fixtures For Production

Springfield, Mass.—Principal speaker at Springfield Chapter's May 14 meeting, at the Highland Hotel, was Howard E. Mills, Manager of Sales and Field Engineering, The Bellows Company, Akron, Ohio.

In discussing "Fully Controlled Air Power Devices," Mr. Mills pointed out the many uses of air operated fixtures and machine attachments for production operations, displaying various types of air motors.

"The Development of the Helicopter" was outlined interestingly and informatively by Robert L. Nields, Test Pilot for Sikorsky Aircraft, Bridgeport, Conn. Mr. Nields described some of the mechanical problems involved in direct lift aircraft, relating some of his personal experiences in flying.

The final session of the season was attended by 106.

BUY MORE BONDS

Linderose Manager Of Rite-Way

Detroit—The appointment of O. S. Linderose, widely known tool engineer, as manager of Rite-Way Tool & Mfg. Company, has been announced by Sidney E. Beach and Leroy Thomas, co-owners of the business.

O. S. Linderose

Mr. Linderose comes to Rite-Way from the Trio Tool Company, where he has filled the position of manager for the past six years. However, his experience and background in tool and process engineering dates back to the hard old school of apprenticeship and a term of capacity-proving in the East, preceding his coming to the old Chalmers Motor Car Company, his first connection in this city. At Chalmers, he won recognition for his part in developing manufacturing procedures and time-and-labor-saving tools which led to advancements with various automotive concerns until enlistment in the Army in World War I temporarily suspended his tooling activities.

Resuming in the East after the war, Mr. Linderose became process engineer for North East Electric Company, at Rochester, N. Y., where he tooled up for the production of the then-sensational, new personal "movie" camera, among other things.

In 1932, Mr. Linderose became engineer for Ford of Canada, and later went to Pressed Metals of America as experimental engineer for two years before coming back to the custom tool, die and gauge industry, and management of the Trio plant, in 1939.

A member of ASTE since 1935, of the Engineering Society of Detroit, and of the Detroit Board of Commerce, Mr. Linderose has also been active in the American Legion, having held several high offices.

GI Sees Industrial Future For Filipinos

Philippine Islands—Golden opportunity for American industry to assist in the postwar development and rehabilitation of the Philippines, with mutual profit, has been noted by Pfc. E. J. Nelsen, Racine Chapter, in his visits to various islands of this Pacific archipelago.

E. J. Nelsen

"The Filipinos were just entering the machine age . . . . among the most interesting discoveries were the steel cutting machines . . . . astonished to see a modern, conveyor-type sugar mill . . . . our larger companies could make a pecuniary profit . . . . over here,"

Pfc. Nelson reports in the following letter recently received at National Headquarters:

"In my travels overseas I have had opportunity to visit many interesting places. My explorations have taken me to Buna and Hollandia on New Guinea, Owi and Biak Island in the Schouten group, and the Philippines. In the Filipino Islands I visited San Jose on Mindoro, and on Leyte, such towns and villages as Ormoc, Tacholan, Beaurran, Dulag, and several others.

"The towns are a mixture of native huts and a few modern buildings. Small children, as bare as the day they were born, run up and down paths that are the towns' streets. In the air there is an odor of drying fish and the undesirable aroma of a carabao.

"Among the most interesting discoveries I made were the steel cutting machines I ran across. In one town there were lathes, shapers, vertical mills and so forth, all in working condition.

"They are old American-made machines and I was surprised to see how well they were taken care of by the natives. In another village I found a couple of electric salt baths and a Japanese vertical mill, manufactured by the Naka Saka Company, which were beyond repair.

"When I visited Ormoc on Leyte and San Jose on Mindoro Island, I was astonished to see a modern conveyor-type sugar mill, with small railroads running to the nearby fields. The mills were still damaged, but the locomotives and tracks had been repaired and were being used.

"Wherever one goes there is evidence that the Filipinos were just entering the machine age, when the war hit them. It is my belief that after we finish this grim business over here, that they will use modern, up-to-date machines and equipment to accomplish the work they have.

"These islands compare with the States, as they were in the latter part of the nineteenth century. There is a great deal of room over here for development of many industries. Many of our larger companies could make a pecuniary profit if they were to invest and develop branches of their industries over here."

Sincerely yours,
E. J. Nelsen

A.S.N. 36829590
8th Radar Cal. Det.
85th Fighter Wing
APO 72, c/o Postmaster
San Francisco, Calif.

In civilian life Pfc. Nelsen was machine tool designer at Modine Mfg. Co., Racine, until entering the armed service in September, 1943.

Narrates Burma Road Building

Detroit, Mich. — Problems encountered in the construction of the Burma Road were related by D. F. Meyers, Engineering Consultant, Studebaker Corporation, South Bend, Indiana, to the May 10 meeting of Detroit Chapter at the Rackham Educational Memorial.

D. F. Meyers

His subject, "China and the Burma Road," was presented from first-hand experience, Mr. Meyers having spent fifteen years in China, setting up and operating a truck factory in Mukden for the Chinese Government, serving as technical advisor to the Chinese Ministry of Finance in Shanghai, Hong Kong and Chunking, to the Chinese Government in Mukden and Peiping, as well as to China Defense Supplies, Inc.

Russell E. Perkey, another Studebaker engineer, described "The Flying Fortress Engine," using enlarged photographic sections and a cutaway model of the Wright Cyclone 1820, recently completed by his company, to illustrate his address.

Present at the meeting was Miss Charline Ihnken, recently-elected second feminine member of Detroit Chapter, who is a Gage and Fixture Designer at Lincoln Motor Company. A graduate of the University of Michigan, Miss Ihnken studied drafting at the Lawrence Institute of Technology night school. Miss Dorothy May Herivel, formerly associated with Goddard & Goddard as a Cutting Tool Designer and now located in Chicago, has the distinction of being the first woman to become affiliated with the Chapter.

Russell E. Perkey of the Studebaker Corporation uses new cutaway model of the Flying Fortress engine to illustrate his lecture at Detroit Chapter meeting May 11.

Attending her first meeting May 11 as a full-fledged member of Detroit Chapter, is Miss Charline Ihnken, a Gage and Fixture Designer at Lincoln Motor Company. With her is her father, Henry Ihnken, Superintendent of the Ford Motor Company, Waterford Plant.

Inset shows Dorothy May Herivel, first woman member elected to Detroit Chapter and formerly associated with Goddard & Goddard as a Cutting Tool Designer. Miss Herivel is now located in Chicago.

Army Rehabilitation Program Success

Louisville, Ky—Guest speaker at the June 11 dinner meeting of Louisville Chapter, held in the Kentucky Hotel, was Major Robert M. Fleming, In Charge of Special Service, Convalescent Program, Bowman Field.

Major Fleming's subject, "Rehabilitation," was an outline of the program being conducted by the Army to restore returning veterans to health and economic usefulness. Citing specific cases, the speaker indicated the success already achieved in this important and necessary undertaking.

William Mivelas of the Industrial Equipment Company presented several sound films which were well received.

Regional Director Kenneth Jasper called attention to the proposed Constitution, urging all members to study it carefully before casting their ballots.

Engaging Speaker Makes Profilometer Easy

Richmond, Ind.—Bringing to his audience a pleasing personality as well as a decidedly interesting lecture, Dr. Ernest J. Abbott, Technical Director of Physicists Research Company, Ann Arbor, Michigan, found ready acceptance as Richmond Chapter's guest speaker June 12 at the Leland Hotel.

Tempering his topic, "Surface Roughness Measurements and the Profilometer," with many humorous incidents concerning the introduction of this comparatively new instrument, Dr. Abbott presented his address in a most informal manner, free from abstruse technical terms. A group of interesting slides, sketches and charts served as illustrations.

Photographs Wanted

Public Relations Chairmen of Chapters — please send PHOTOGRAPHS with Chapter News items if possible.

ASTE Must Warn Industry Of Socialistic Perils

Cincinnati, Ohio—"Creation, not destruction, makes wealth.... and hard work is the basis of the creation of values..... Private employers have manufactured work at a profit—Government almost invariably does so at a loss..... Government now owns and controls a very large share of our production facilities.... providing a ready made handle for socialistic planners.....

John H. Van Deventer

Peirce Lewis

"You [ASTE] possess the necessary channels of distribution to reach every employer.... inform them of the seriousness of these pressures..... Employers must.... convince their workers of the necessity of co-operative effort to keep America free.....

"If we are to hope to win this great coming postwar economic battle against Government ownership which is merely national defeatism, employers must become more self-reliant..... by making more goods and services available for more people at lower cost." This was the essence of the message prepared by John H. Van Deventer, President and Editorial Director of Iron Age, and presented at Cincinnati Chapter's Seventh Anniversary dinner, May 12, by Peirce Lewis, Regional Business Manager of the publication's Detroit office.

The thought-provoking address, entitled "Great Expectations Versus Realities" and published in full in the June issue of *The Tool Engineer,* made a profound impression on the approximately 350 members and guests attending the banquet at Hotel Alms, dedicated to American industry's contribution to the war effort.

Greetings were extended by Hon. James G. Stewart, Mayor of Cincinnati, and by ASTE President C. V. Briner of Cleveland, who urged co-operation with National Headquarters.

Other distinguished guests included Edward A. Muller, Chairman of the Board, King Machine Tool Company, who introduced the guest speaker; Lt. Col. George M. Enos, Cincinnati Ordnance District; Lt. Bartlett, Inspector of Naval Materials; Frank J. Santry, Deputy Supervisor, WPB; August H. Tuechter, President, The Cincinnati Bickford Tool Company; Millard Romaine, Executive, The Cincinnati Committee for Economic Development; ASTE National Treasurer W. J. Frederick and Regional Director Howard F. Volz, members of Cincinnati and Columbus Chapters respectively.

Chapter Activities in This Issue

IS YOUR CHAPTER REPRESENTED?

Chapter	Page	Chapter	Page
Akron	69, 76	(Newark) Northern New Jersey	67
Atlanta	75	New Haven	75
Binghamton	66	New Orleans	76
Boston	69, 77, 78	Philadelphia	77, 78
Buffalo-Niagara Frontier	68, 70, 78	Pittsburgh	66
Cedar Rapids	65, 66	(Port Arthur-Fort William, Ont., Can.) Lakehead	80
Chicago	67	Pontiac	68
Cincinnati	80	Portland (Ore.)	67
Cleveland	70, 78	(Providence) Little Rhody	75
Columbus	66	Richmond	79
Dayton	77, 78	Rochester	75
Detroit	69, 75, 79	San Diego	76
Flint	66, 67, 69	(San Francisco) Golden Gate	76
Fond du Lac	68	Springfield (Mass.)	78
Fort Wayne	75	Syracuse	67
(Grand Rapids) Western Michigan	67	Toronto	76
Hamilton (Ont.)	69, 75	(Washington, D. C.) Potomac	66
Hartford	66, 78	Williamsport	75
Houston	70	Worcester	80
Indianapolis	67, 75	(York) Central Pennsylvania	77
Los Angeles	75		
Louisville	79		
(Minneapolis-St. Paul) Twin Cities	69		

Tooling for Internal Grinding

Worcester, Mass.—Walter M. Smith, Eastern Sales Manager for the Bryant Chucking Grinder Company, Springfield, Vt., was technical speaker May 1 at Worcester Chapter's meeting in Putnam & Thurston's Restaurant.

W. M. Smith

Emphasizing the importance of good tooling for both production and tool room work, Mr. Smith's address on "Tooling For Better Internal Grinding" also covered tooling for other classes of machine tool work. His talk was followed by an excellent sound film of the same title which received high praise from the 95 members and guests present. Group discussion concluded the meeting.

* * *

A very profitable evening was spent at the previous meeting with Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Carporation, Buffalo. Valuable ideas concerning the production of aluminum aircraft parts were presented in his address on "New Production Methods," which was preceded by films showing jet propelled airplanes and Bell Helicopters.

Among the guests present was Director W. W. Young who spoke on various Society projects.

War Brings New Grinding Wheels

Fort William, Ont.—H. J. Jeffers, Abrasive Field Engineer, and W. C. Effrich, Western District Manager, both of the Canadian Carborundum Company, Ltd., were guests of Lakehead Chapter when it met May 15 at the Royal Edward Hotel.

Prefacing his address with the screening of two films, "Hone Abrading," and "First Principles in Grinding," Mr. Jeffers spoke on grinding in industry, revealing how the pressure of wartime production had changed the construction of abrasive wheels. He also emphasized the importance of producing wheels with a safety factor well over the working stress load.

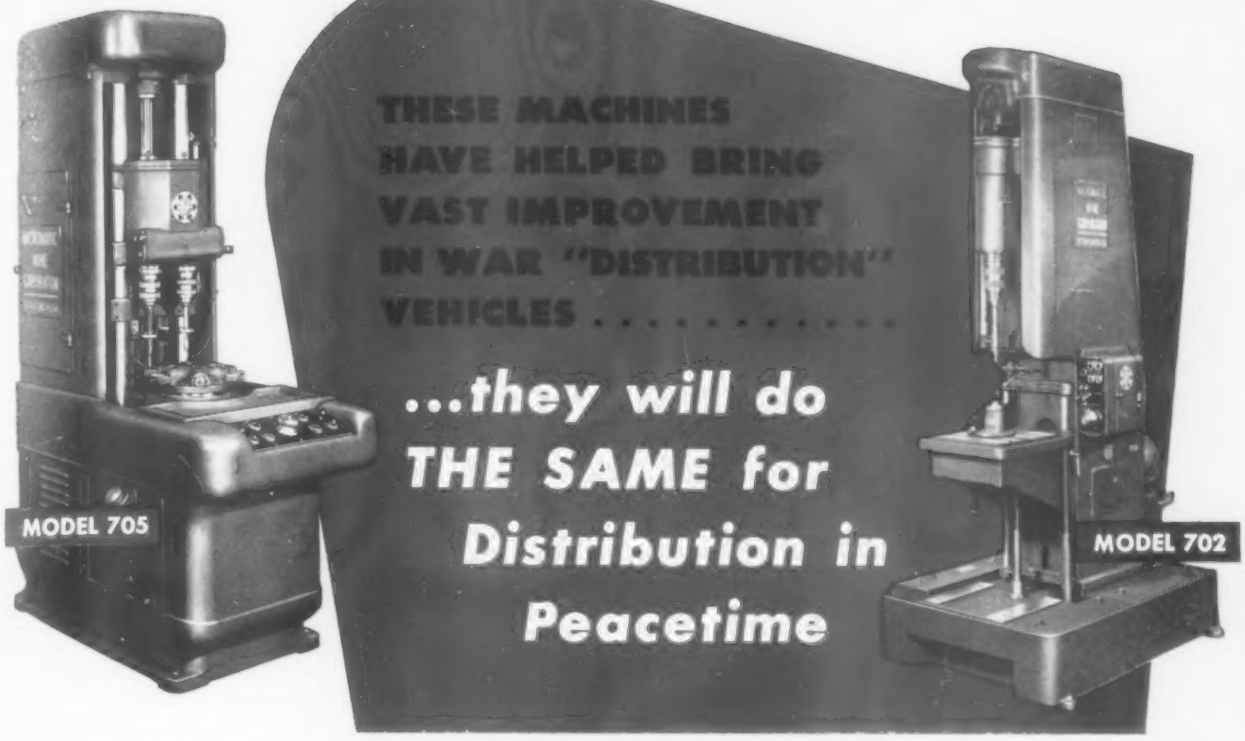
The speaker invited the group to participate in the ensuing discussion of grinding problems.

Wagner Accepts Post At Lincoln

Detroit, Mich.—Walter F. Wagner, Assistant General Superintendent of the Ford Willow Run Bomber Plant during its span of activity, has joined the Lincoln Motor Company to take charge of its Tooling Center. In this capacity, he will supervise the tooling of the new Lincoln automobile.

W. F. Wagner

Mr. Wagner was associated with the Lincoln plant as Master Mechanic before becoming an executive at Willow Run. A distinguished ASTE'er, he is a charter member and Past President of the Society.



While cost is a secondary consideration in distribution of war materials, other needs parallel peacetime distribution. Lighter, more easily operated equipment—higher pay loads—easier maintenance, and less of it—are all vital. Micromatic Honing machines have helped wartime distribution to these goals—will do the same for industry after the war. At the same time they will help lower initial and operating costs of distribution machinery—lower costs of goods delivered.

MODEL 705

VERTICAL HYDROHONER

Micromatic Model 705 Multiple Spindle Vertical Hydrohoner has built-in automatic Microsize Control which gauges work automatically—holds within tolerance of .0001" for geometric accuracy and .0003" for *uniform diameter size*—automatically stops honing cycle when correct size is reached. For internal honing or bores ¼" to 2" diameter. Rotary indexing work fixture provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. (Illustrated above, left).

Precision sphericity without measurable error is generated on ball studs by the Micromatic Ball Stud Honer.

Removes .030" stock on diameter from turned heat treated forgings.

Precision honing of long pieces—external or internal—is the work of the Micromatic Horizontal Floor Type Honer. Either hydraulic or manual control or tools. Set-ups available to generate either cross-hatch or co-directional finish patterns.

MODEL 702 Single Spindle Type HYDROHONER

Single Spindle Type Micromatic Hydrohoner Model 702 for rapid production honing of bores or cylindrical surfaces up to 2" in diameter. (Illustrated above, right).

Silver plated bearings are production honed on a Micromatic Horizontal. Costs were reduced 50% from previous methods.

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MAKERS OF HONING MACHINE TOOLS

The Drafting Office And The Works

Coordination between engineering and production essential to maximum manufacturing economy

The following article, which is reprinted from MACHINERY LLOYD, is not only in line with the A.S.T.E. Educational program, but shows that the English TOOL ENGINEERS think as we do regarding the supplementing of technical training with shop practice. Such dual training is essential to maximum economy in mass manufacture.

One provocative thought is presented, viz: that instructions on drawings be clear to all concerned. Symbols and abbreviations that may be obvious to the technically trained may be so much Greek to the shop man, may even be confusing to engineers in other plants.

This is proven out by numerous requests, coming into the A.S.T.E. offices, for clarifications on ambiguous abbreviations. This holds especially for materials specifications where, one may surmise, the designer "passed the buck" to the tool room or to production. A drawing should contain all of the information necessary for a clear understanding of requirements.

Ed.

THERE is a considerable measure of truth in the statement that the drawing office, including the designs department, determines the profit or loss shown on the final balance sheet of the average engineering concern.

In these days of standardization there is little difference between the quotations received from various firms for a 500 h.p. Diesel engine or a turbo alternator or a 10 h.p. electric motor. Assuming similar speeds the constants employed in the design are similar and it is only in the details of the design where savings in manufacturing costs are secured, which enable one firm to make a larger profit than their competitors. It is in this respect that the drawing office becomes of serious importance.

There are always a number of alternative methods of manufacturing a component. It may, for example, be cast, welded or pressed, and, afterwards, it can be machined in a variety of ways, all to produce the same final result. The choice depends largely upon the draughtsman and, for him to give his best he should be familiar with all the machine tools in the works, their capacities and possibilities. That the draughtsman should have had an adequate workshop training goes without saying.

The "black-coated" draughtsman is the cause of much of the friction which exists between the works and the drawing office. It is he who makes it necessary for the works to "breed specially trained rats to wriggle into corners to tighten up inaccessible nuts," who specifies 3/16" tapped holes in steel castings, and who produces designs which necessitate loose pieces and other abominations in the patterns sent to the foundry.

Draftsman Must Know Shop Limitations

But merely to have received a good workshop training is not sufficient. The draughtsman should know what is the largest casting he can swing and the longest shaft which can be turned in the lathes available in the works where he is employed. He should know the capacities of the automatics, planing machines, gear cutters and all other machines. This information should be displayed in the drawing offices so that he can produce his designs in a form which can readily be machined without causing the works to rig up special tackle, which is often ingenious and of which the works are always proud, but which, nevertheless, increases the cost of manufacture. It is, therefore, suggested that the procedure adopted by certain firms whereby the works are divorced from the drawing office is wrong and not conducive to the highest efficiency. It is obviously undesirable that draughtsmen should be given a free pass to wander round the works at will, but facilities should be available for them to discuss manufacturing procedure with foremen and others.

Knowledge of Foundry Practice Essential

Draughtsmen should be especially familiar with the work of the foundry, so that when producing a design they will know whether the job is to be cast in green sand or dry sand, whether suitable boxes are available and, if the job is to be machine moulded, the type of moulding machine which is most suitable. In this connection more use could be made of "Stripper" moulding machines, which can produce castings without taper and are, therefore, much more readily gripped in three-jaw self-centering chucks.

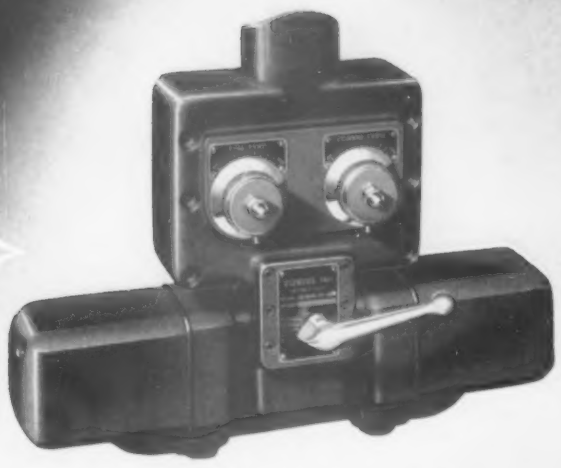
It is the custom in some works engaged on repetition work to build several experimental models of a new design, using temporary jigs, and then, after tests, to hold a conference to settle the final design. This procedure is useful but extremely expensive, because it often means the scrapping of jigs, patterns and fixtures which could be avoided if a conference was held before the part is manufactured.

In view of recent developments in surface finish, heat treatment and methods of production, there is some confliction of opinion as to the number of instructions which should appear on a working drawing. If such drawings are to be regarded as instructions to enable a competent workman to make the part, it is surely reasonable that in some form or other the information should appear. Such instructions as "ground," "welded" or "hardened" without further information are meaningless and only annoy the production department, whilst the various suggested hieroglyphics will certainly annoy some of the workers. Probably a compromise, whereby brief instructions are given in a side column, is the best solution. These instructions should state whatever is applicable of the following: The exact material (the mere words "Mild Steel" is insufficient), the suggested method of manufacture, tolerances, surfaces finish, heat treatment and hardness, machine tools on which the work could be produced and so forth. It is here where collaboration with the works comes in and it is suggested that these points should be settled before the drawing is passed to the works.

An extreme example of the lack of co-ordination of the type which doubtless many readers can provide examples, concerns a number of high tensile nickel steel bolts for "Government Department" which specified a tolerance of plus or minus a quarter of a thousandth of an inch. This necessitated a reduced rate of output, with rigid inspection. Later we saw these bolts in use. They were painted to prevent rusting and pushed through holes in wood!

SMOOTH and CONSTANT FEED RATE

regardless of fluctuations in work resistance or hydraulic operating pressure



Double Solenoid Type Push-button Operation

VICKERS "Traverse and Feed Cycle" CONTROL PANELS

These panels provide self-contained, compact control units for automatic machine applications where the cycle is a combination of rapid advance, one or two feeds, and rapid return motions. The two feed rates are infinitely variable within their ranges, and adjustments can be made during feed. Applications include drilling, reaming, boring, turning, milling and swaging machinery.

The hydraulic circuit in the panel employs the well-known Vickers Flow Control Valve in a "metering-out" circuit which means a smooth and constantly maintained feed rate for any given adjustment regardless of fluctuations in cutting tool resistance or changes in hydraulic operating pressure.

Simplicity is evident from the fact that there are only two working parts that move. Many standard modifications are available; feeds can be in either direction or both directions; operation is by single or double solenoids integral with panel, separate solenoids or pilot pressure. Practically any cycle sequence can be obtained. See Bulletin 41-10 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS *Incorporated*

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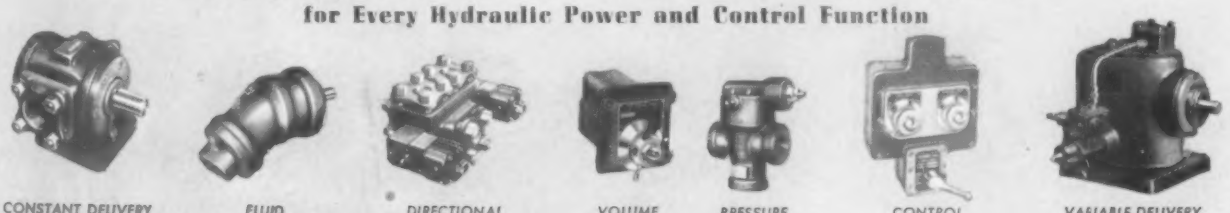


CONSTANT DELIVERY PUMPS · FLUID MOTORS · DIRECTIONAL CONTROLS · VOLUME CONTROLS · PRESSURE CONTROLS · CONTROL ASSEMBLIES · VARIABLE DELIVERY PUMPS

By W. F. Schaphorst

The Hinged Motor—It Always Does The "Right" Thing

It is all a matter of leverage, and tension varies in direct ratio to the load.

NOW THAT hinged base, belted motor drives are coming into general use, there are various explanations (?), by the uninitiated, for the automatic rocking action of the base. For example, it has been variously claimed that this swinging action of the motor is caused by "centrifugal action," by "inertia" of the motor, and so on, while others claim that belt tension remains the same regardless of the fact that the leverage is constantly increasing and decreasing as the motor rocks on its hinge.

All of these explanations are incorrect, as will be shown. Before going into that, however, let us consider the proposition as graphically illustrated in Figs. 1, 2 and 3. When the motor is idle, as in Fig. 1, the belt is unstretched with the center of the motor almost directly over the hinge. The distance "L" is then smallest, just as it should be.

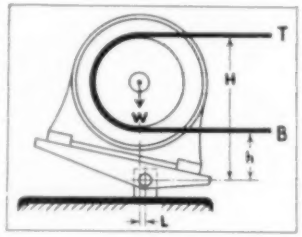


FIG. 1. Idle position

Upon starting (Fig. 2), the motor automatically "backs into the belt," and the distance "L" becomes greatest, thereby imparting maximum tension on the belt. In other words, the motor does precisely what it *should* do, for best starting conditions. Finally, when the load becomes normal, as in Fig. 3, the motor swings slightly toward the right, when the distance "L" decreases to normal—that is, for the desired tension on the belt. That too, is exactly as it should be.

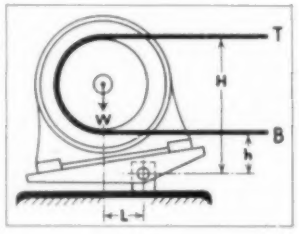


FIG. 2. Starting position

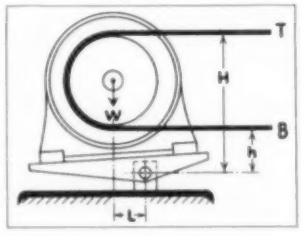


FIG. 3. Normal (running position)

The "how" is very simple, and can be easily figured out by anyone having a knowledge of simple arithmetic. Using the letter symbols, W = weight of motor in lbs., L = lever arm of motor, T = tension of upper belt in lbs., and H is its lever arm. B = tension of lower belt, and h is its lever arm. With that in mind, we proceed as follows:

(a) Multiply the weight W by the distance L in inches.
(b) Multiply T by the distance H.
(c) Multiply B by the distance h.

Now, add (b) and (c), when it will be found that, in any or all of the three positions, the sum of b and c will always be equal to a.

Motor "Backs Into Belt"

The above being established, it is easy to understand why the motor "backs into the belt." It is due to the fact that tensions T and B vary with the load. When idle, the tensions T and B are equal and T may be greater than it is at any other time. Since T has the greater lever arm (H) it naturally pulls the motor to the right.

Then, when the motor starts, tension B increases and T reduces. Often, tension T becomes almost zero. Furthermore, the greater the movement of the motor to the left, the shorter h becomes, all of which is favorable to the highest necessary tension B when starting.

Finally, after the load is up to speed and conditions become normal, tension B automatically reduces and T increases. The increase in T and the advantage of its longer lever arm (H) pulls the motor back to normal running position. And all that is as it *should* be. The motor automatically does the *right* thing, all the time.

Same Principles for Bottom or Top Pull

Of course, a simple illustration has been used, and simple terms. The drive shown is bottom pull, and the belts, top and bottom, are shown horizontal. Regardless of whether the belt is bottom or top pull, and regardless of direction of belt travel, the same principles apply to any problem. It is always possible to calculate and foretell the exact action of the motor if one knows its weight and characteristics, and if one knows the several lever arms, L, H and h. There is nothing mysterious about it.

Sidelights on Pneumatic Installation

EDITOR, THE TOOL ENGINEER:

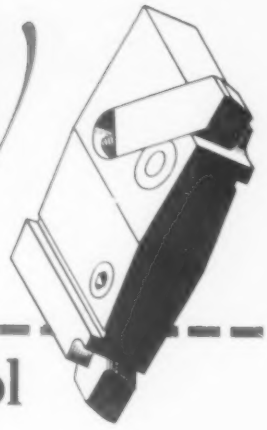
I have read with interest the article by Mr. J. C. Cotner, in the May TOOL ENGINEER, entitled "Elements of Pneumatic Installation."

However, I should like to offer a suggestion with regard to Mr. Cotner's piping diagram on both the main air-line receiver and auxiliary air-line receiver. On numerous occasions we have encountered the problem of hot air being distributed to the portable tools used in the plant. On many of these occasions, it has been my experience that when air receivers are set-up as shown in these diagrams, hot air is delivered to the tools, due to the fact that the outlet is piped out of the top of the receiver. We have found that by moving the outlet to the center of one side of the receiver, or a little below center, this trouble has been eliminated. We have also found that this does not interfere with removal of condensation and does not give us undue condensation in the air lines.

I was very glad to see an article on pneumatic installation appear in a widely circulated publication such as "The Tool Engineer" and believe it will be of benefit to plant engineers inasmuch as considerable confusion is always encountered in air line set-ups.

Very truly yours,
THE CLEVELAND PNEUMATIC TOOL COMPANY
C. M. HUSS, *District Manager*
(Member Chicago Chapter ASTE)

new



Block Type Boring Tool

quick change

This quick detachable cutter block provides self-centering, positive locking, quick inserting of block in boring bar and easy removal, without the aid of locating holes or screws, keys, wedges or taper pins.

The block containing the fully adjustable blades is simplicity itself. Made to engage both sides of the precision ground flats on the bar it quickly and accurately centers itself. When located, the cutting thrust pressure is evenly distributed against the back and bottom of the slot.

This new tool combines quick change, positive drive and accuracy. Greater rigidity is assured because the bar is free from centralizing screw holes.

HOW IT WORKS: To Insert Block slip block through the slot in the bar until the projecting lugs engage the ground flats on the bar. It is then perfectly centered. Snap in spring clips which hold the block in place and effectively seal the unit from dirt, chips, etc.

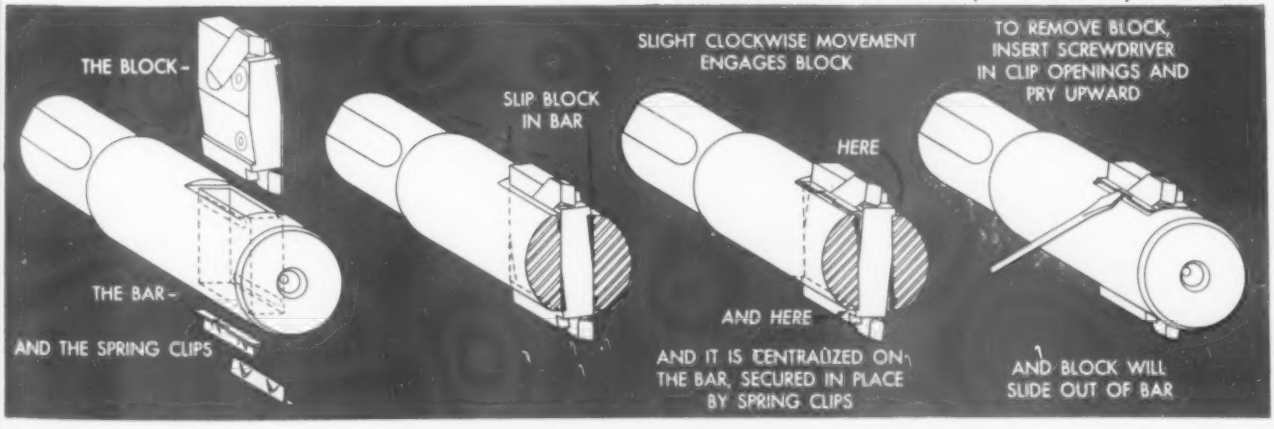
To Remove Block flip out clips, disengage the contact surfaces and withdraw the block.

Blocks can be reversed in bars for inverted operations.

Write for our illustrated folder describing these tools in detail.

GAIRING

THE GAIRING TOOL COMPANY, DETROIT 32, MICHIGAN


THE BLOCK –
THE BAR –
AND THE SPRING CLIPS
SLIP BLOCK IN BAR
SLIGHT CLOCKWISE MOVEMENT ENGAGES BLOCK
HERE
AND HERE
AND IT IS CENTRALIZED ON THE BAR, SECURED IN PLACE BY SPRING CLIPS
TO REMOVE BLOCK, INSERT SCREWDRIVER IN CLIP OPENINGS AND PRY UPWARD
AND BLOCK WILL SLIDE OUT OF BAR

INTRICATELY FORMED METAL STAMPINGS

a specialty with the

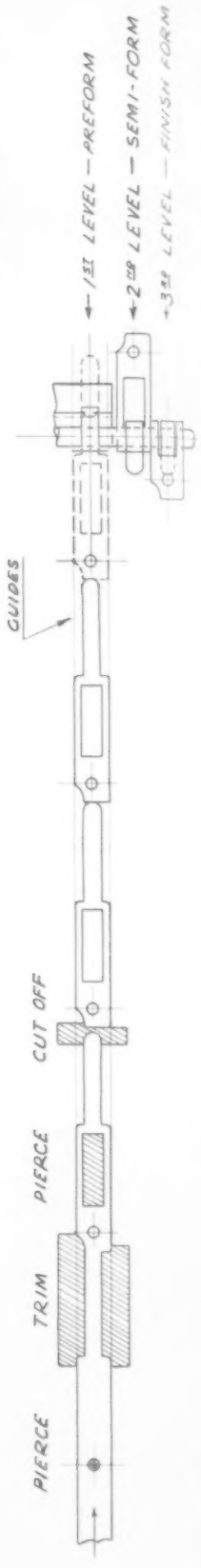
U.S. MULTI SLIDES

THE upper photograph shows an intricately formed part made from .095" copper which is produced complete from coil stock at a speed of 90 per minute in a U. S. Multi-Slide Machine. The particular model used for the work is known as the No. 33 U. S. Multi-Slide and a reduced photograph of this machine is shown below.

An inspection of the stock and tool layout shows that the blank is pierced, trimmed, and cut off in the die head and that the forming is carried out on three levels. After preliminary forming the partially formed blank is transferred by the stripper mechanism to the second level of the intermediate forming operation and then to the third level for finish forming. The motions of the die head, forming slides, and stripper are all cam controlled and split type cams are used throughout for easy removal and set-up.

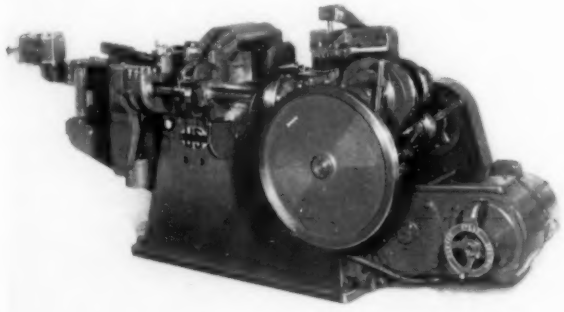
This is just one of the many different types of complicated formed stampings which can be handled aptomatically and economically on the U. S. Multi-Slide Machines. Many parts, of course, can be completely formed on one level, and the three level forming is brought out simply to emphasize the versatility of the machine.

Bulletin No. 15T contains complete specifications—ask for your copy.



U. S. TOOL COMPANY, INC.

Ampere (East Orange)
New Jersey



Builders of U. S. Multi Slides—U. S. Multi Millers—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

VERS · O · TOOLS

with

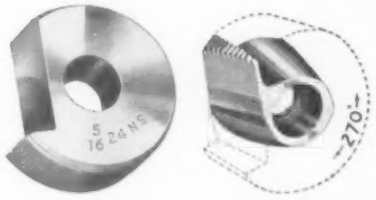
Circular Chasers

– CUT CLEANER THREADS
– LAST LONGER
– SAVE TIME

1 Class 3 precision holds throughout long runs. Reground chasers quickly inserted without disturbing the setup.

After replacing chasers,
THE FIRST PIECE IS PRODUCTION

2 Chasers last longer, because they may be reground through 270° circumference. Ten to fifty times longer chaser life.



3 Time saved, because replacing chasers is a two-minute job. No trial runs needed.

Ground Thread Circular Chasers and Circular Cutters, used with the Vers-o-tool Head, do all these precision jobs — thread cutting, end turning and forming, knurling, burnishing, combination threading and turning.

Catalog D-42-B gives complete details.

The NATIONAL ACME CO.

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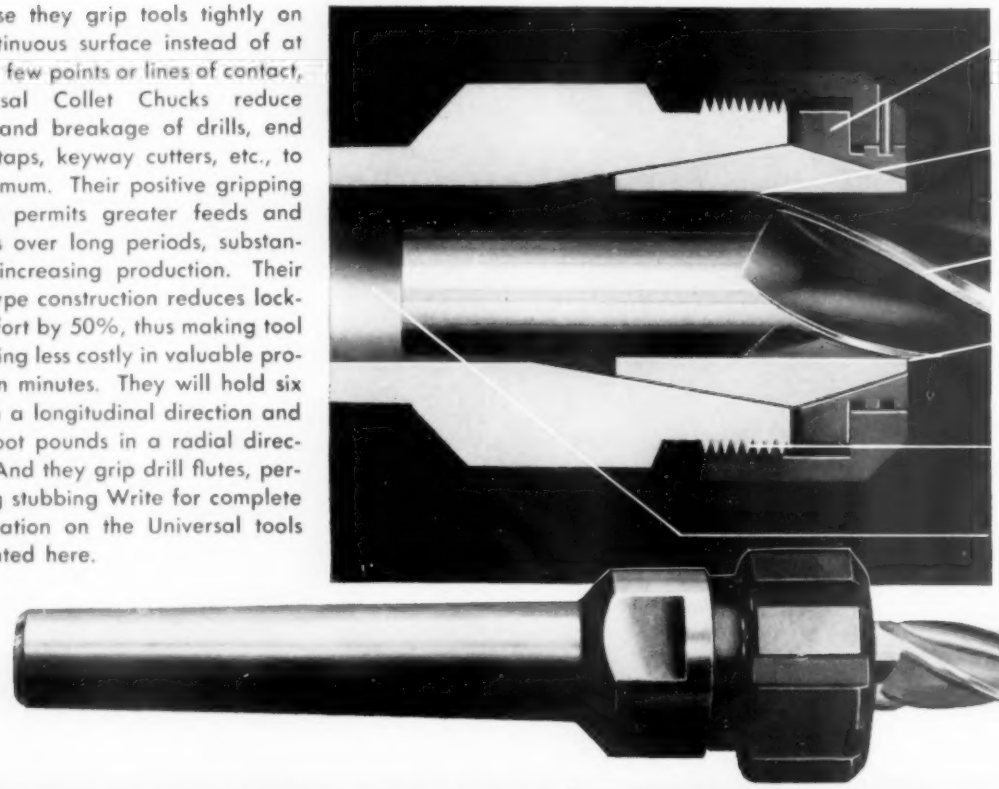
Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics · Single Spindle Automatics · Automatic Threading Dies and Taps · The Chronolog · Limit, Motor Starter and Control Station Switches · Solenoids Centrifuges · Contract Manufacturing

UNIVERSAL COLLET CHUCK GRIPS TOOLS TIGHT AS A VISE

Permits Greater Speeds and Feeds Without Tool Flutter

Because they grip tools tightly on a continuous surface instead of at only a few points or lines of contact, Universal Collet Chucks reduce wear and breakage of drills, end mills, taps, keyway cutters, etc., to a minimum. Their positive gripping power permits greater feeds and speeds over long periods, substantially increasing production. Their new type construction reduces locking effort by 50%, thus making tool changing less costly in valuable production minutes. They will hold six tons in a longitudinal direction and fifty foot pounds in a radial direction. And they grip drill flutes, permitting stubbing Write for complete information on the Universal tools illustrated here.



Nut tightens on floating sleeve, reduces locking effort 50%.

Collet grips on continuous surface — not at 3 or more points.

Grips drill flutes, permitting stubbing.

Guaranteed run out .001", one inch from chuck.

Hardened and ground threads.

No back up screw required for thrust.

UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT
Standard Collet Chuck
Standard Drill Bushing

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

TOOL STEEL DATA

Revised data for High Speed Steels including types, analyses, uses, hardening characteristics and temperature ranges

(July 1945)

HIGH SPEED STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES	HARDENING CHARACTERISTICS	
				HARDENING TEMPERATURES	QUENCH RC
High Tungsten	CLARITE -T1H-	C .72 W 18.00 Cr 4.00 V 1.15	Lathe Tools Cutters Reamers Drills and Taps Broaches	Range: 2200°F. to 2350°F. For Maximum Cutting Capacity 2350°F. For Hardness and Toughness 2300°F. For Increased Toughness 2200°F. (For Hot Work 2000°F.)	Oil.....63-65 Salt Bath...63-65 Air.....60-63
Molybdenum Tungsten	MOLITE -M2H-	C .82 W 6.50 Mo 5.00 Cr 4.15 V 1.90	Lathe Tools Cutters Reamers Drills and Taps Broaches	Range: 2100°F. to 2275°F. For Maximum Cutting Capacity 2275°F. For Hardness and Toughness 2200°F. For Heavy Impact 2100°F.	Oil.....63-65 Salt Bath...63-65 Air.....60-63
High Vanadium	VANITE -T2H-	C .82 W 18.50 Cr 4.25 V 2.15 Mo .70	Long Life: Form Tools Lathe Tools Milling Cutters Turning: Chilled Rolls Car Wheels	Range: 2300°F. to 2350°F.	Oil.....64-66 Salt Bath...64-66
Cobalt	MAXITE -T8H-	C .73 W 14.00 Cr 4.00 V 2.15 Co 4.75	Heavy Duty Turning: Axles Car Wheels Cast Iron	Range: 2325°F. to 2375°F.	Oil.....63-65 Salt Bath...63-65

TEMPERING: Double tempering is recommended. Temper cutting tools at 1050°F. for maximum secondary hardness. To increase toughness and resistance to heat checking on hot work applications, tempering temperatures up to 1300°F. may be used.

COLUMBIA TOOL STEEL COMPANY

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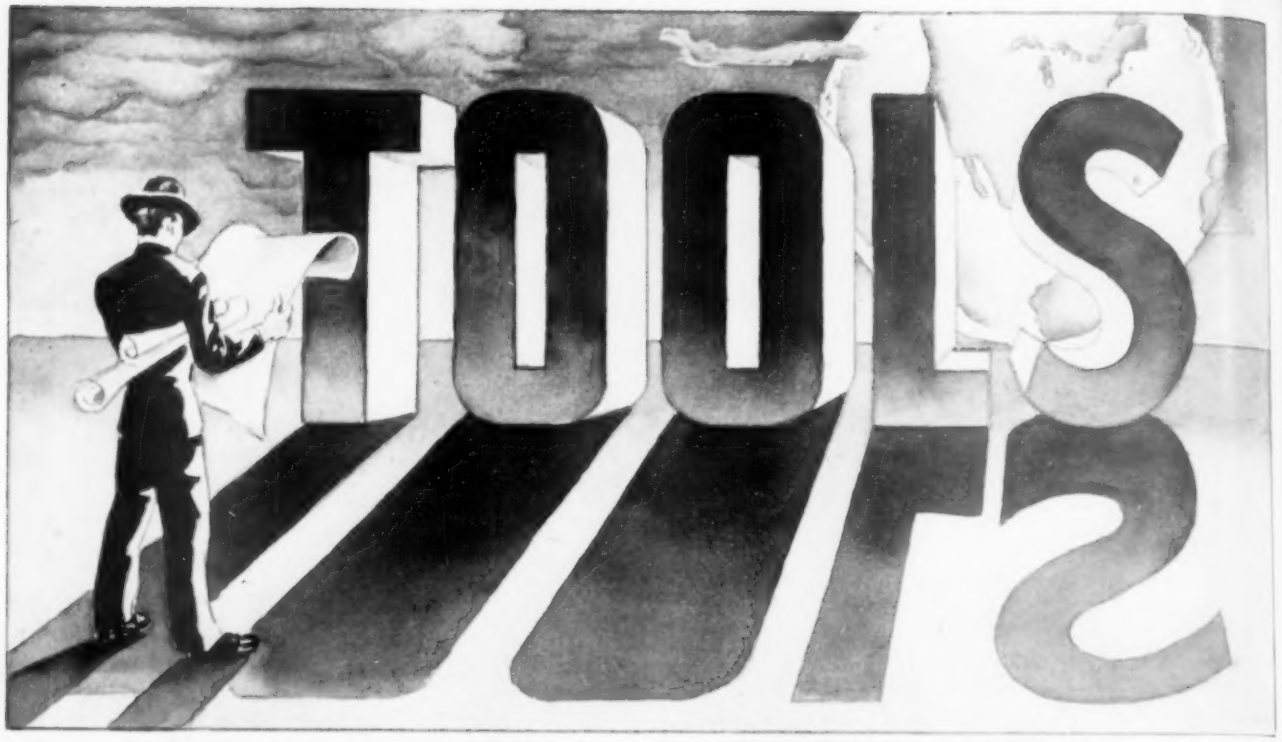


In Your Post War Plans

Why not decide to get more and better work out of tools, to meet keen competition?

Take advantage of treatments available here which often improve tools 30% to 60% or more. We have specialized in tool treating for a quarter-century. The war has brought new and better methods for original hardening, and also for supplementary treatings of tools purchased in a hardened, finished condition.

Now is the time to investigate. Let us show you how other manufacturers have already benefited.

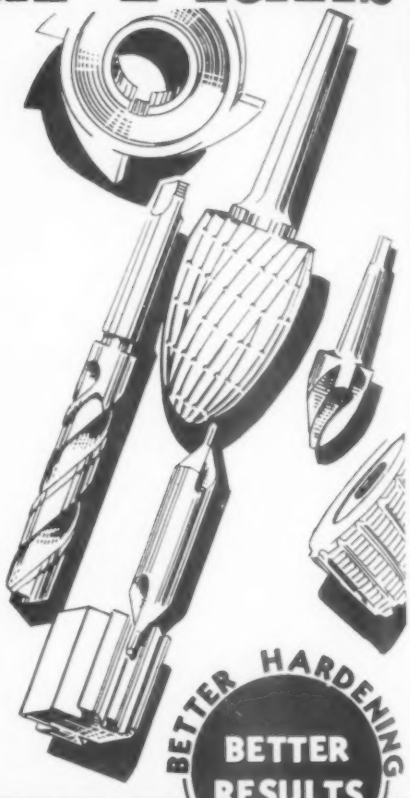
Write for booklet, "FIFTY FACTS" . . . It tells what other manufacturers did to improve tool quality and life.

More than half the tools now in common use can be treated so they will run longer between grinds, hold size better, and produce a smoother finish.

Our "Silver Finish" is bright, clean hardening.

Our "Nusite" means harder, tougher cutting tools.

Our "Ad-Life" improves the tools you buy outside.

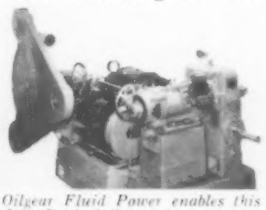


PERFECTION
TOOL & METAL HEAT TREATING CO.
1740-58 WEST HUBBARD STREET CHICAGO 22, ILL.

Oilgear Fluid Power extends range of amazing wire coating machines

The John Royle & Sons tubers are amazing machines that are coating millions of feet of wire with rubber or plastic insulation each week to meet the exacting requirements of the Signal Corps. Previously, not one of these tubers could produce its full capacity; the mechanical transmissions with which they were equipped originally just were not broad enough in their speed range to permit *one* standard tuber to coat *many* different sizes of wire uniformly with the required thickness of rubber or plastic.

But Oilgear Fluid Power could meet that need . . . and did. The Oilgear Transmission gives a broad range of controlled speeds to the capstan and rewind drive of this machine, enabling the latter to handle more sizes of wire and to do a much better job of coating the wire it handles. Similar benefits can be yours . . . if you will investigate the amazing possibilities of Oilgear Fluid Power for your straight line feeds or rotary drives. No matter what your power transmission problem is, you should know what Oilgear can do. THE OILGEAR COMPANY, 1308 W. Bruce St., Milwaukee 4, Wisconsin.



Oilgear Fluid Power enables this John Royle & Sons tubing machine to process many sizes of wire with required thicknesses of coating.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR *Fluid Power*

Now CARBIDE THREAD MILLING CUTTERS

5

FIRSTS BY PLAN-O-MILL

- First to install General Electric's remarkable new Thy-mo-trol electronic feed control!
- First planetary to mill external threads with standard multiple thread cutter!
- First planetary to coordinate feeds and speeds!
- First to provide absolute control of feed-in!
- First to offer a practical, low cost carbide thread milling cutter!

Attractive deliveries can be made on Planco High-Speed Steel Thread and Form Milling Cutters.

Now, to the proven speed and accuracy of thread milling, Plan-O-Mill brings you the proven *extra* advantage of cemented carbide. This tough, wear resistant material, forming the cutting edges of Planco Carbide Thread Milling Cutters, gives you greater accuracy, greater speed, and many more parts per grind. No tooling change is necessary.

Planco Carbide Thread Milling Cutters are available in National, Whitworth, Acme, V, and special forms, with or without provision for the Higbee cut. Both shank and shell type cutters are offered.

For increased production with maximum savings in time, money, and manpower — tool up today with Planco Carbide Thread Milling Cutters!

PLAN-O-MILL CORPORATION
1511 E. EIGHT MILE ROAD
HAZEL PARK, MICH.

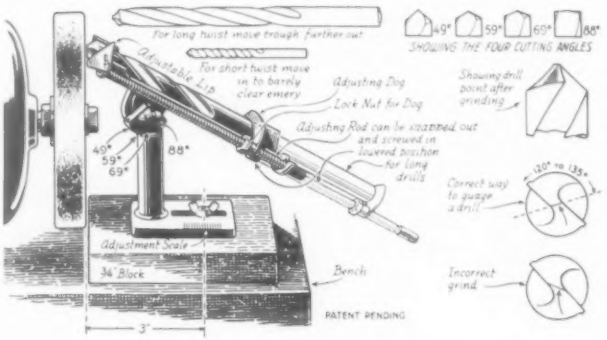
THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM MILLING PLAN-CO CUTTERS

TOOLS OF TODAY

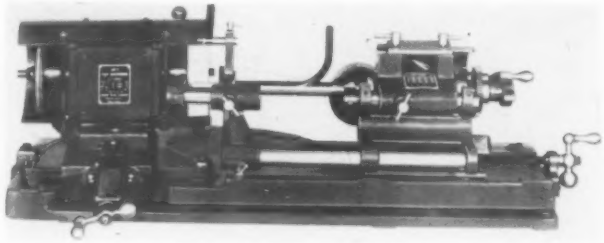
Drill Grinding Attachment

LOW PRICED and dependable, and designed to simplify difficult drill-grinding operations, an improved model of the SUPER DRILL GRINDING ATTACHMENT provides for accurately grinding S.S. drills in 4 point angles:—49, 59, 69 and 88 degrees. The attachment will hold drills from 3/32" to 1 1/16" in dia., and from 1½" to 11" in length. Use of the fiixture gives true drill centers, desired clearance and rounded points. The attachment is immediately available from the maker. *A. D. McBurney*, 939 West 6th St., Los Angeles, California.



Grinding Attachment For Tapper Taps

A NEW GRINDING ATTACHMENT, for use with any model No. 2 Blake Tap Grinder now in use, and which may be quickly mounted and dismounted, is announced by *Edward Blake Co.*, 634 Commonwealth Ave., Newton Center 59, Mass. This attachment is for sharpening bent and hook shank taps, and uses a center to support the front of the tap, and a short grip collet on the shank immediately back of the thread. Because the shank may not always be true with the threads, this method of holding has been proven the most accurate for holding tapper taps during the sharpening operation.



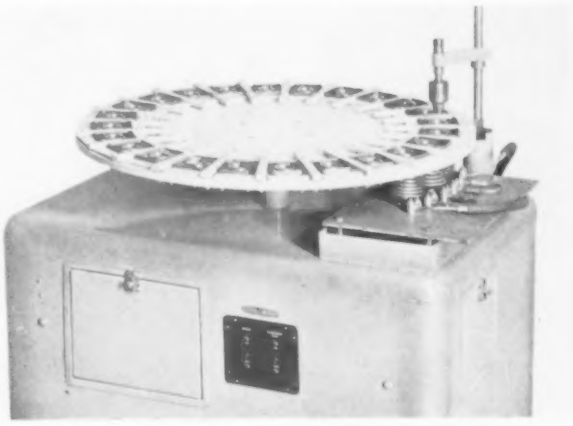
The attachment will permit grinding the chamfer on any bent shank tapper tap up to 1/2"-13 used on the 1/8", 3/16" 1/4", 3/8", or 1/2" automatic tappers, and any hook shank tap up to 9/16"-18 used on 1/4", 3/8" or 1/2" Precision Tappers, as made by the National Machinery Company, Tiffin, Ohio. Either right or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes may be sharpened on the chamfer, with any amount of relief desired. Both precision and speed are attained, as the Blake Tap Grinder is operated in the usual manner when the attachment is used.

Index Carrier for Brazing

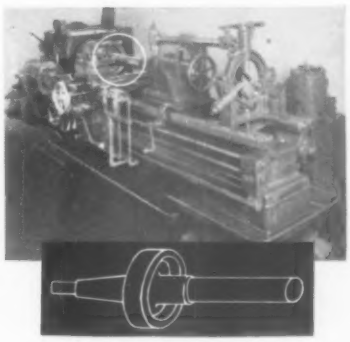
DESIGNED FOR mass production brazing of metal assemblies, a new 24-STATION CIRCULAR INDEX CARRIER, mounted on an 18-KW electronic high frequency generator, ejects a complete assembly every 12 seconds. Both the carrier and the generator are products of *Scientific Electric Div.* of *"S" Corrugated Quenched Cap Co.*, 107-119 Monroe St., Garfield, N.J.

Heat is applied by a set of three water cooled induction coils located under three of the work positions, and the coils are followed by a vertically operating ejecting mechanism, with carrier drive by a small motor. The operator is only required to load the stations as they come around empty.

The carrier can be applied to any of the company's electronic generators with ratings of 5 to 100 KW., depending on the heat input requirements of the work. Normal output of the unit is at 200 to 600 kilocycles.



New Turchan Method



A NEW APPLICATION of the TURCHAN HYDRAULIC FOLLOWER MACHINE whereby the facing of the curved recess in a 14-inch diameter aircraft engine drive shaft is performed on a lathe in 1/9th the time formerly required, has recently been made public by the *Turchan Follower Machine Co.*, 8259 Livernois, Detroit 4, Michigan.

The method previously followed involved the use of 4 forming tools, whereas, by the Turchan method of duplicating the curved recess by means of a simple template, a single turning tool does the job. Because of the faster feed rate thus made possible, and the elimination of all tool changes, the job is now completed in 10 minutes instead of 90 minutes as formerly required.

Using the template as a guide, the Turchan attachment controls the tool so as to insure automatic sizing of the recess with only perfunctory attention on the part of the operator.

New Comptorplug

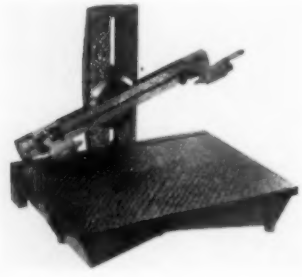
A NEW MODEL COMPTORPLUG, designated as P-2 and further described in Bulletin 31, available to interested firms, is announced by the *Comptor Company*, Waltham, Mass. One of the outstanding features claimed for this model is the new shock absorbing movement.

Originally designed as a precision check gage to meet the urgency of war production, the instrument has been widely and successfully used at machines, and for routine bench inspection, often by trainees. As a result, it was subjected to considerable rough handling.

To further add to its unique suitability for precision gaging by relatively unskilled users, the shock-absorbing movement is now standard, and can be applied to existing P-1 models.

Universal Checking Plate

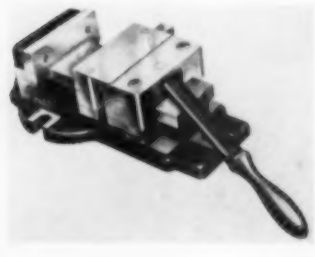
ANNOUNCED BY *Master Industries*, Inc., 709 E. 38th St., Indianapolis 5, a new UNIVERSAL CHECKING PLATE is so designed that angle blocks and other accessories usually used with surface plate checking can be entirely eliminated. Instead, the tool is provided with bench centers, riser and angle plates, in addition to a vertical riser bar for holding work at any angle, all mounted on the accurately scraped back of the plate.



In addition a 20″ Universal Sine Bar, similarly mounted, is furnished. This makes it possible to check angle and taper work, either between centers or in Vee blocks. While plates of various sizes can be furnished, it is brought out that the design permits about 50 per cent more working area than is provided by conventional plates of the same size. Descriptive literature available upon request.

Fast Production Vise

OPERATING ON the wedge-lock principle, a fast operating PRODUCTION VISE, announced by *The Universal Engineering Co.*, Frankenmuth, Mich., is said to reduce work change time in milling machine and drill press work up to 80%.



A short, 15 degree pull on the locking lever clamps work in the vise, and a second pull of only 7 degrees locks the workpiece firmly into position, ready for production. Because pressure is applied to the adjustable jaw through taper wedges, no hammering or forcing is necessary, hence, no fatigue to operator. In production work, operator can load with one hand and manipulate the vise with the other. Made in three sizes—4″, 5″ and 6″, the vise is quickly adjusted to varying workpieces. Descriptive literature on request.

Metric Gage Blocks

Continental Machines, Inc., 1301 Washington Ave., South Minneapolis 4, makers of DoAll precision gage blocks and instruments, announces a new series of METRIC GAGE BLOCKS, designed to meet the needs of both foreign and domestic manufacturers working to the Metric system. These blocks are offered in two grades; an inspection quality guaranteed accurate within plus or minus .0001 mm, and a working quality accurate within plus or minus .0002 mm.

The set consists of 38 blocks, plus two wear blocks—the latter of tungsten carbide in the inspection grade—and can be made into over 100,000 combinations ranging from 1.01 mm to 100 mm in increments of .01 mm. A special 1.005 mm block provides special combinations for closer tolerances when required.

With these blocks, which embody all the accuracy, stability and wearability demanded of precision gage blocks, the usual policy of converting from English to Metric is naturally eliminated. Although caliberated in Metric, however, the DoAll blocks can also be used to make up English system combinations.

Universal Mill Key

AMONG THE SIMPLER devices lately made available to industry, a Mill "Key" now marketed by *Vlier Mfg. Company*, 4552 Beverly Blvd., Los Angeles 4, Calif., will find a ready receptance. Made in two sizes—for ¾″, 11/16″ and ⅝″ table slots, in the larger, and 9/16″, ½″ and ⅜″ in the smaller—these Keys permit setting up a vise or fixture on any machine regardless of size of tee slot. This feature makes them an invaluable item in any toolroom or manufacturing plant.

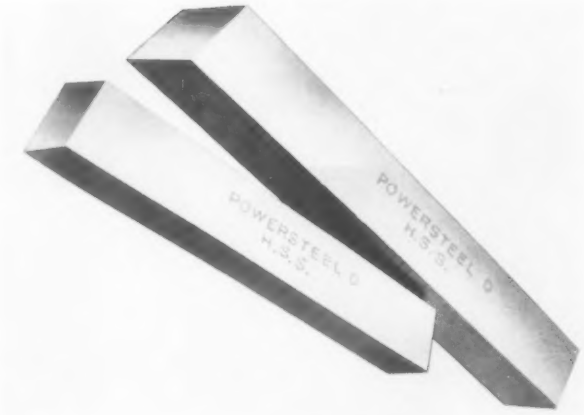
Hydraulic Cylinder Calculator

OF PARTICULAR INTEREST to many of our readers who have to do with hydraulic equipment, *Hanna Engineering Works*, 1765 Elston Ave., Chicago 22, has developed a *hydraulic cylinder calculator* which readily computes the various factors in hydraulic cylinder application.

It provides for nineteen distinct calculations on its several scales, these including cylinder size, pressure, cylinder speed, size of pump, valves, pipe and motor—in fact, about everything one needs to know about the job. They are available free of charge.

Cobalt Cutting Tool

POWERSTEEL, A NEW solid cast steel cutting tool, introduced by *Crobalt, Inc.*, Ann Arbor, Michigan, is said to increase cutting speed by at least 20 per cent. In addition, it will retain its cutting ability, on many types of work, several fold over that previously considered possible. On the whole, however, claims are conservative, and while Powersteel Tools are not recommended as a panacea for all cutting problems, they have been tried out on the "firing line" and the types of work for which they are best suited adequately determined.



These tools are produced by melting a special Cobalt steel alloy in an indirect arc rocking electric furnace, super heating to well over 3000°F., and casting in molds of approximate tool size. By this process, it is claimed that the metal acquires a preferred grain and carbide particle size at time of casting, thereby obviating the need for forging and later heat treatment. Tools are supplied hardened and ground, ready for use, and may be resharpened and used as long as there is stock for gripping in the tool holders.

They are avaiable in nine standard square bit sizes and in five rectangular shapes. Further information may be had in a descriptive bulletin, available on request.

Compensation Live Center

A LIVE CENTER TAILSTOCK SPINDLE that provides automatic compensation for heat expansion of the work has been developed by *Pope Machinery Corporation*, Haverhill, Mass. This accessory solves one of the critical problems of lathe or grinder operation—the excessive loads often imposed on live center bearings due to expansion of work from the heat generated in processing.

With the Pope Tailstock, compensation is automatic and effected without even a slight displacement of the center from its true axial position while under load. This is essential since, for best results, the live center spindle must be mounted on precision anti-friction bearings so that the weight of the work or the stress of the cutting tool will not cause the center to be moved from its true axial rotation.

These precision, compensation live center tailstock units have spindles mounted on oversize, preloaded, precision S.K.F. double row roller bearings having abundant capacity to carry the radial loads.

Complete information, as to specific application, may be had from the maker.

Lead Screw Tapping Machine

DESIGNED AND BUILT by *Detroit Tap & Tool Co.*, Detroit, a standard LEAD SCREW TAPPING MACHINE, provided with a simple, manually operated fixture, has greatly "upped" the tapping of .800"-16 class 3 threads in a Southern ordnance plant. The threads are tapped to a depth of exactly 5/8" in the nose of 88 mm. smoke shells, and must be concentric with the bourrelet of the shell.

In loading, the operator sets the shell—which is light enough to be held in one hand—into the fixture over a Vee block. (See photo). With his free hand, he swings a lever, connected by rack and pinion, both to the plunger support and the transverse clamping bar, about 60°. Swinging the lever, the plunger elevates the shell until the nose contacts the lower surface of the locating platen, while at the same time moving the simple transverse clamping bar to the left. This motion locates the shell horizontally against the Vee and clamps it in place. In this way, the shell is located and clamped simultaneously and concentrically with the tap spindle, plunger and against a Vee and to the exact height of the nose in relation to the tap spindle, with but one short movement of the lever.

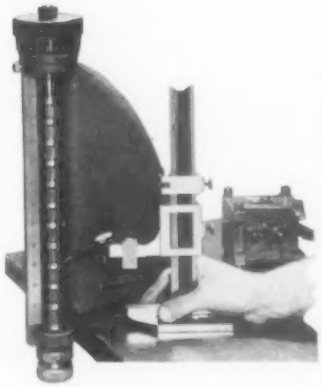
Returning the lever through the 60° arc frees the tapped shell for unloading. And, since the drive to the tap, in the Detroit light duty tapping machines, is at the base of the lead screw, wind-up is eliminated. With this arrangement, metal does not pile up on the back of the tap teeth, and rapid return is effected without injury to the cut thread.

Gage For Surface Plate Work

DEVELOPED BY *Cadillac Gage Company*, 20316 Hoover Road, Detroit 5, a new gage for surface plate work—called the PLA-CHEK—is guaranteed accurate to .00005" for any size from .001" to 12" from the surface. Also, it is claimed to be many times faster, in use, than ordinary gage blocks.

The gage proper, which is mounted on a simple, triangular-shaped support bracket, is made from a hardened steel bar having 12 steps exactly spaced 1" apart, and is provided with a micrometer screw, thread ground, at the lower end, and a large micrometer thimble, graduated in .0001", at the upper.

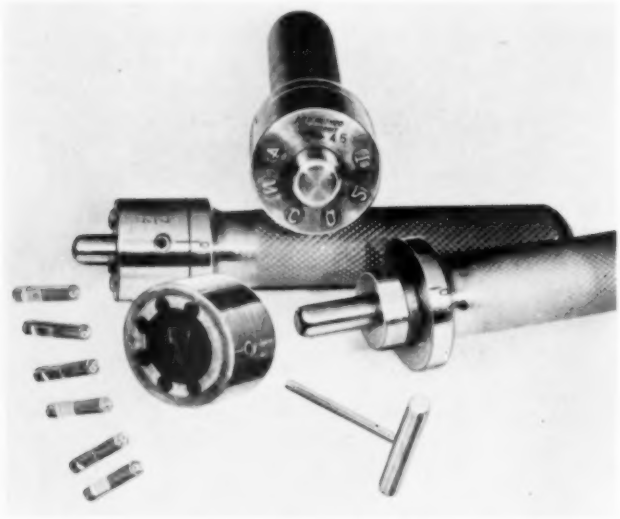
When checking work on the surface plate, the micrometer thimble is set at zero, when the lower end of the bar and the surface of the plate are exactly level. The micrometer may then be adjusted to the desired dimension in thousandths and tens of thousands. All other measurements, up to 12" may then be taken from any desired inch step. The Pla-Chek gages are offered on a two-week free trial. Further information may be had from the makers.



New Marking Tools

TWO NEW MARKING TOOLS, one an interchangeable type holder for use with automatic roll marking devices (above) and, another (below), a hand stamping device, are recent products of NEW METHOD STEEL STAMPS, Inc., 147 Jos. Campau, Detroit 7. The one provided with a wedge locking action, holds type more firmly than is usually possible with conventional rectangular or square grooves. Thereby, chatter is eliminated and life of type prolonged.

The other incorporates features of design whereby a single character may be removed without disturbing the rest. This marker is particularly applicable to fast, annular stamping of heat treat codes on gears, sleeves, bushings, and so on, the design being such that variations to suit individual requirements may be readily made. Detailed information may be had from the makers.



Heavy Duty Foundry Flask

HEAVY DUTY FOUNDRY FLASKS of a new type, designed for installation with straight or cut-to-pattern flask bars, are now being manufactured by *Algoma Products*, 3080 E. Outer Drive, Detroit 12, Mich.

Of welded construction, from hot-rolled steel, and normalized by heat treating to retain stresses, these flasks are rugged and sturdy and may be had on reasonably short delivery. Further information is available in descriptive literature.

Universal Chucking Grinder

DESIGNED FOR external and internal cylindrical grinding, a new GEARGRIND machine has an extremely wide range of application on a variety of forms. For example, it will grind conical generated or formed spherical surfaces, or formed annular surfaces, such as ball bearing races or fillets, either external or internal. It will also grind combinations of various forms in a simple set-up, thereby insuring accurate concentricity in addition to perfect blending of curves, radii and straight surfaces.

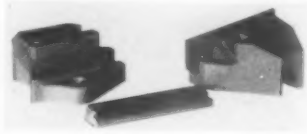
As shown by the illustration, the machine is nicely engineered, with the construction incorporating many desirable features. The base is heavy to reduce vibration, and the various operating and control units are nicely disposed and accessible. The oscillating vertical spindle, as well as work head and grinding head spindles, are all dynamically balanced and equipped with precision, preloaded ball bearings.

Other features include quick acting clamping attachments for collets and diaphragm chucks, micrometer feed screws for work head set-up and grinding wheel spindles, and adjustable diamond wheel trueing device. In combination, these features tend to enhance the extreme accuracy and to reduce production costs.

A folder, fully describing this machine, may be had from *Gear Grinding Machine Company*, 3901 Christopher, Detroit 11, Michigan.

"Lanrac" Chasers and Holders

KNOWN AS "Lanrac," because of the rack tooth arrangement employed to locate the chaser in the approximate position, a new CHASER and CHASER HOLDER, announced by *Landis Machine Company*, Waynesboro, Pa., is said to greatly simplify interchanging of chasers and, by imparting greater rigidity to enhance thread accuracy.



When interchanging chasers, they are approximately located and clamped lightly, when they are advanced by an adjusting screw. Elongated slots in the chaser clamp permit sufficient lateral movement slightly greater than the pitch of the rack. "Lanrac" chasers may be used with old type chaser holders without the use of the Lanrac type clamp.

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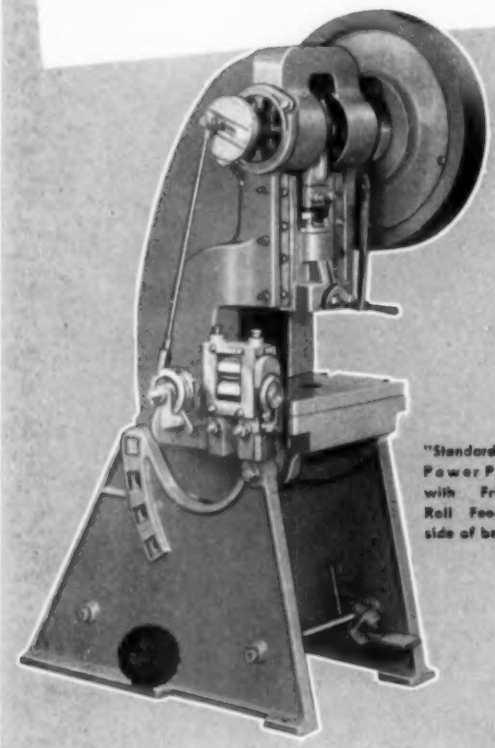

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Furnished in crank or knuckle styles with direct or back geared drive. May be equipped with dial or friction roll feeds. Capacities to 400 tons.

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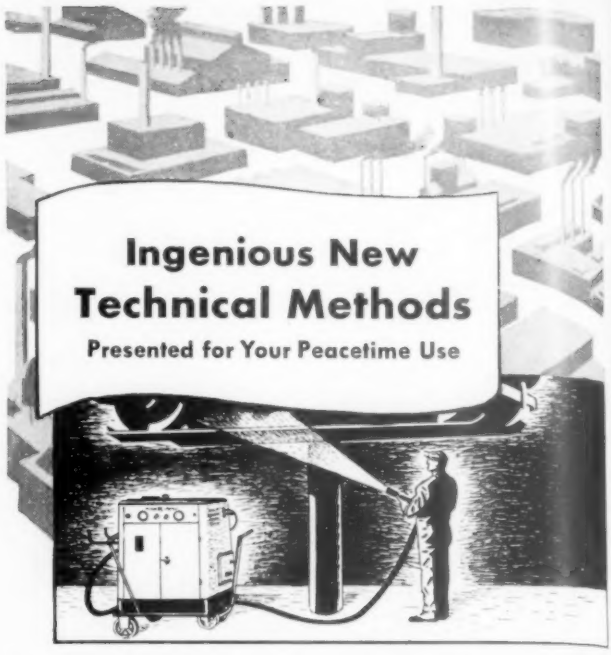

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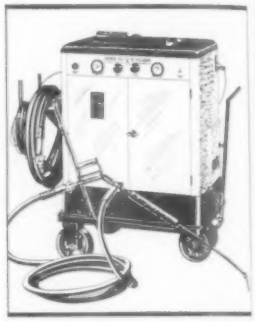
with Steam Rig Now the Army's Standby

An economical solution to the problem of cleaning and degreasing trucks, passenger cars, tractors, locomotives, excavators, and the like will be available to garages, service stations, all users of oil-burning equipment, as soon as war demands permit. It is a more efficient steam cleaner now in use by the thousands in the Armed Forces.



The Kerrick Kleaner

Neat "housekeeping" has too often been neglected by industry due to the costliness of hand labor. But the best housekeepers in the World, the U. S. Army, Navy and Marine Corps, dare not neglect frequent and thorough cleaning of all equipment to safeguard against fire and malfunctioning, and to permit fast, certain inspection. This cleaner, developed to meet their high standards, removes grease, dirt and grit 5 times as fast as any other method. It cleans by a balanced combination of heat, detergent, water and friction. It is typically "army" in simplicity of design and operation; in 30 minutes, the entire machine can be dismantled and completely cleaned.

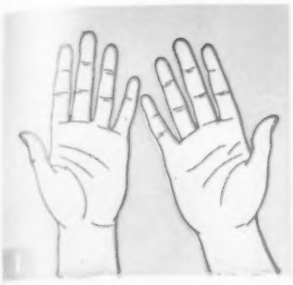
Wartime uses of Wrigley's Spearmint Gum also point the way that industry may benefit when this quality product again becomes available. It will *again* be a "help on the job" in many ways. Right now *no* Wrigley's Spearmint is being made, as present conditions do not permit the manufacture of Wrigley's Spearmint in quantity and quality sufficient for all. But remember the Wrigley's Spearmint wrapper—it is a certificate of highest quality and flavor—and will always remain just that.

Remember this wrapper

You can get complete information from Clayton Manufacturing Company Alhambra, California

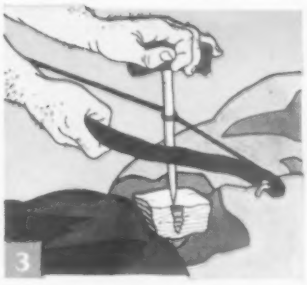
Z-75

It started with the other hand



Right or left-handed, your *other* hand is a type of jig.

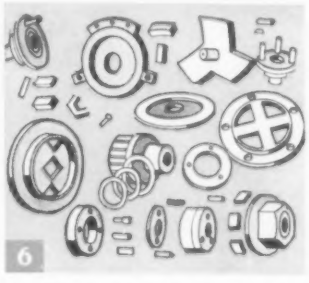
A jig is something to hold work while you're working on it.



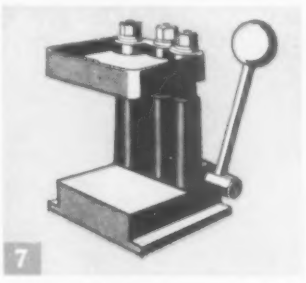
Notches in stones or logs left both hands free.

Two heavy stones once served as a sort of vise or jig.

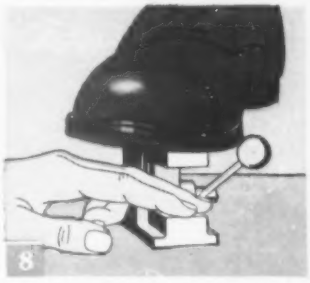
Modern adjustable jigs have two faults. Some slip, hurt people.



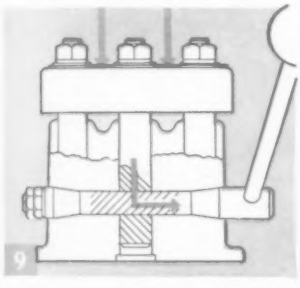
Locking mechanisms of others wear out fast or fail.



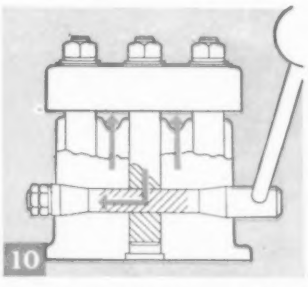
These problems were solved by Woodworth's CONE-LOK JIG.



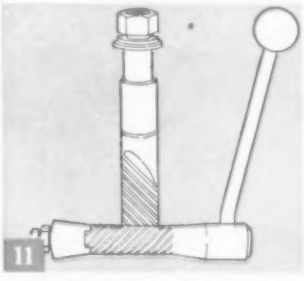
This amazing jig locks instantly. Can't slip. Protects workers.



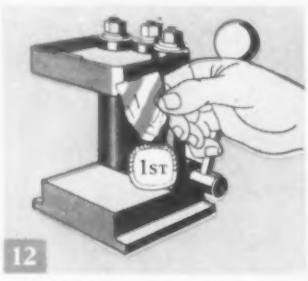
Force on top travels thru 45° gear to right. Left cone locks.



Force from below is transmitted to left . . . locks cone at right.



CONE-LOK JIG is simple. Three moving parts do the job.



CONE-LOK is praised by production men everywhere.

What Woodworth products mean to industry

THE contribution to mass production efficiency made by the CONE-LOK JIG is typical of all Woodworth products.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

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PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

TAPPING TIPS

From Woody Spencer's Notebook

Give Your Tapping Jobs The Right Start

You'd be surprised to know how many tapping jobs get off to a bad start because the lubricant wasn't matched up with the material being tapped. And I mean matched up. The right lubricant can make the job run 10 times easier. A while back I wrote that some of the boys had found skim-milk to be the best lubricant for copper. But that's only one. For almost every type of material there is one certain lubricant that has been found to work best—at least in the big majority of cases. Finding the lubricant that's recommended for a certain material isn't hard. Any good lubrication chart will show you. I've got one in my Handy Tap Guide. So make sure your next tapping job goes as easy as possible. Just get the right lubricant to start.

These Tapping Tips are not intended to be an infallible guide to all tapping operations. They're just intended to pass along any information that will make jobs run a little easier and quicker—maybe save some taps and cut rejections.

The individual problem that comes up with almost every tapping job requires a specific engineering solution. So, if you will send us complete information on the job (material, depth, diameter, lubricant, etc.), our engineers will be glad to make recommendations without obligations.

** Note—Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them.*

Our complete, new catalog just off the press. Send your request on company stationary.

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

MADE FROM

MEEHANITE METAL

SURFACE PLATES
ANGLE PLATES
UNIVERSAL RIGHT ANGLES
BOX PARALLELS
MASTERANGLE PLATES
STRAIGHT EDGES
TOOLMAKERS' KNEE
LAPPING PLATES
FLAT PARALLELS
TRY SQUARES
ANGLE ATTACHMENTS

These precision production tools incorporate every factor that contributes to accuracy. The Honeycomb pattern surface plate distributes the weight evenly over the entire surface. Meehanite Metal—a specially processed iron recognized for its uniform textures, fine close grain, strength and solidity, through all sections. A special heat treatment is given the iron to relieve casting and machine strains. This PREVENTS distortion and changes taking place after the surface has once been scraped.

Write for Descriptive Circular

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Assembly TIME SAVERS!

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Pneumatic

NUT SETTERS and SCREW DRIVERS

Model 131 Impact Wrench. *¼" to ⅜" capacity. Reversible.*

Model 106 Impact Wrench. *¼" capacity. Reversible.*

Make your time-studies *now* on nut-setting and screw-driving operations with ARO Pneumatic Tools! Note the speed and big power of these small tools—with light weight that means less fatigue on assembly jobs!

Whether it's ARO Impact Tools designed with Controlled Torque . . . or other ARO models for all types of small tool jobs . . . you can count on ARO Performance to keep costs down and production UP! Write for catalog. The Aro Equipment Corporation, Bryan, Ohio.

ARO

PNEUMATIC TOOLS

Model 1011 Impact Screw Driver and Nut Setter *shown with No. 2 Phillips bit. ¼" capacity.*

Model 22LPH Straight Type Nut Setter. *Lever throttle. Capacity ¼".*

Model 22PAH Pistol Grip Nut Setter. *Capacity ¼".*

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The magnetic circuit in Rockford Power-Grip Chucks penetrates chuck and work, locking them together in a power grip that holds for heavy cuts on milling machine, shaper or planer.

Knotty Holding Jobs Simplified
Costly Time Lags Eliminated

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WRITE FOR THE POWER-GRIP BOOK

How to Prolong the Life of TAPS AND REAMERS

Taps and reamers are often discarded, long before they are worn out, because of inaccuracies in the work performed—such as oversize or bell-mouthed holes due to spindle misalignment. Their usefulness can be greatly extended in many cases by merely using them in a different type of holder—the Ziegler Floating Tool Holder.

Here is a tool holder that automatically compensates for spindle misalignment up to 1/32" radius or 1/16" diameter. Not only does it greatly reduce set-up time, but it also eliminates spoilage losses that are common with other types of holders when not properly set up.

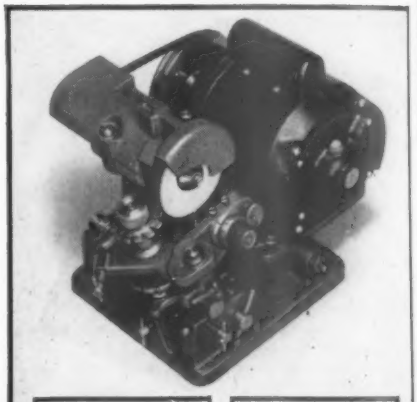
W. M. ZIEGLER TOOL CO.
1930 Twelfth Street — Detroit 16, Mich.

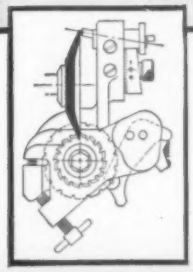
WRITE FOR CATALOG

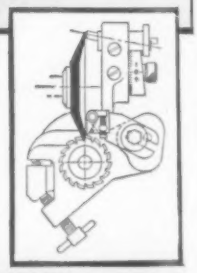
Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

"DON'T SEND A MAN TO DO A BOY'S JOB"

Use the Small Waltham CUTTER SHARPENER







TO SHARPEN SMALL CUTTERS *FASTER* and more *ACCURATELY*

By keeping cutters sharp on a Waltham Cutter Sharpener, your production machinery can be kept at peak efficiency. Sharp cutters produce more work, more accurately—sharp cutters make any machine perform better. The Waltham is a bench tool—it is fast and accurate even when operated by unskilled help—it is *especially designed* for sharpening gear and thread milling cutters, straight fluted hobs and multiple cutters that are not much over 2 inches in diameter and 3/8 inches thick.

The Waltham is regularly furnished with precision index plates (left line drawing), and may be equipped with a pawl device for locating on the top or back of the teeth (right line drawing).

No machine is better than the cutting edge of the tool it uses.

T. E.

EDWARD BLAKE COMPANY

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BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 344 which gives full details on the Waltham Cutter Sharpener.

Name..... Title.....
Company.....
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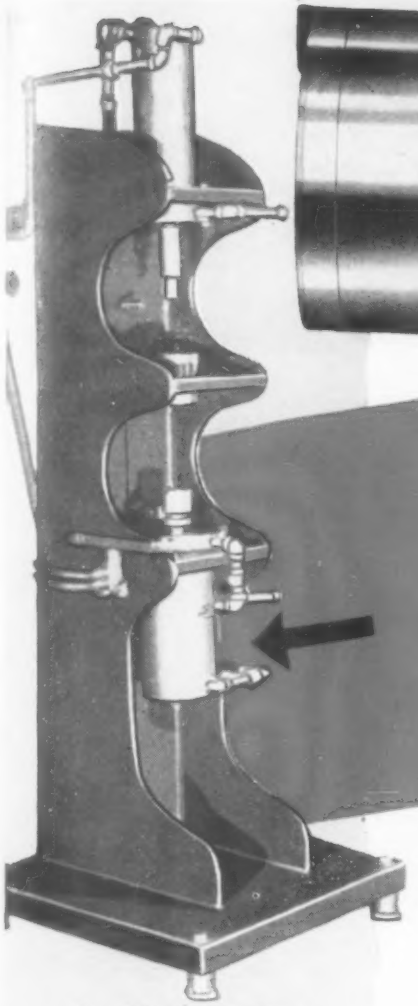
City..... State.....



Two Anker-Holth Stationary Air Cylinders on press for assembling patented rubber cushion bearings at Bushings, Inc., Berkley, Michigan.

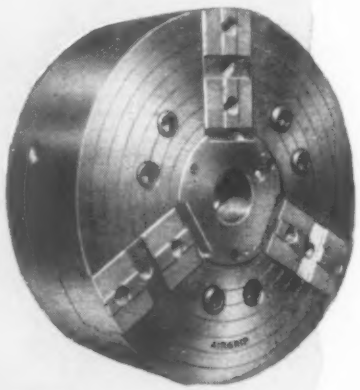
Help Solve the Manpower Crisis with

AIRGRIP

Dual Action

STATIONARY CYLINDERS

Wherever controlled pull, push, lift or grip is needed, "Airgrip" *Dual Action* Stationary Air Cylinders provide the fast, safe, smooth, dependable power that does the job right. Require no skilled labor to take apart or assemble. *No tie-rods;* either end of cylinder can be removed, leaving the rest completely assembled. Piston packings graphite-treated for permanent lubrication. No manual adjustments of copper-braided asbestos packing necessary. Wear automatically taken up by air pressure within cylinder. Made to the same precision standards that characterize "Airgrip" Revolving Air Cylinders.



When buying new lathes, be sure to specify 'Airgrip'" Chucks and Revolving Air Cylinders.

Airgrip CHUCKS

Two-Fisted Gripping Power

Air pressure plus cam-wedge action gives *Double Gripping Power.* Jaws are locked mechanically when gripping either externally or internally. Holds securely even if air supply fails.

OTHER ANKER-HOLTH COST REDUCERS include Air Operated Collets, Arbors, Mandrels, Drill Press Chucks, 2- and 3-Jaw Finger and Compensating Chucks, Revolving Air Cylinders, Lubricating Assemblies, 3- or 4-way Air Valves (hand or foot operated), etc. Also Hydraulic Pressure Units and Fittings.

Write, mentioning products on which you desire Bulletins

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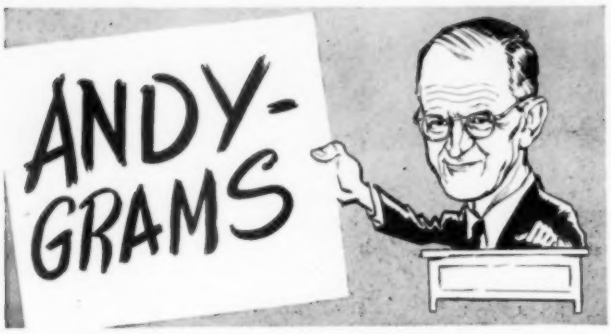

SINCE MY EARLIEST recollection, I have been interested in people, the ancient and the modern, the masses as well as individuals. And, through the years, I have become impressed by the quiet simplicity—and often, the deep humility—of the truly great. Nor, in this connection, do I associate greatness with pomp and fanfare nor, necessarily, with riches or magnificence, however the great may achieve opulence as a reward for outstanding service.

I recall, for instance, the quiet dignity of Booker T. Washington, great negro educator, and latterly, have been an interested follower of the life work of Dr. George Washington Carver, negro scientist to whom America as a whole and the South in particular is forever indebted for his outstanding contributions to our economic and social standards. By raising the one, he enhanced the other. Born in slavery, these men not only cancelled the costs of the corporal emancipation of a race, but contributed remarkably to its social emancipation. Yet, these were humble men.

~ ~ ~ ~

THESE THOUGHTS CAME to mind when, listening in on the speeches incidental to the recent (Detroit) party for Lt. Gen. Wm. S. Knudsen, I heard that *master of mass production* eulogized in flowing oratory by luminaries in industry and government. But when *our Bill*—for that is the way we think of him—got up to make a response, there was no smooth flow of oratory. Rather, his was the slow speech, perhaps rendered the more stilted by repressed emotion, of a man to whom words are but a means to an end, not an end in themselves. His *forte* is in the doing, not in talking about his deeds.

There is a certain similarity in the careers of Knudsen and the negro leaders referred to above. For where they contributed to the intellectual and economic emancipation of their race—yes, and of many whites as well—Knudsen's was a major contribution to the liberation, from slavery under totalitarianism, of the entire world, his native land included.

His innate mechanical ability and broad knowledge of the techniques of mass production, plus his genius for organization, were major factors in the miraculous achievement, on the part of American industry, in meeting the demands of war emergency. And because those demands were met—and how!—and because of the valor of our fighting men, right triumphs over initial might.

A native born Dane, Knudsen's homeland was among those ground, but not crushed, under the heel of the oppressor. For the Danes never surrendered; they merely endured, the while they bided the resurrection of their mythical *Holger Danske*.* And Holger Danske did awake, albeit he had become known under another name—Bill Knudsen—and, in the reincarnation, had become an American by choice. A great American, be it said, but a humble man withal.

~ ~ ~ ~

ALMOST COINCIDENTALLY WITH the Knudsen reception, I was privileged to be one of many guests at a birthday party, held at the Cranbrook Academy of Art in honor of Carl Milles, the sculptor, on the seventieth anniversary of his birth. And I want to tell you about it although, while the memory of that perfect June evening will remain fresh until I pass into the Great Unknown, I am afraid that the word portrayal will fall far short of the vision.

We sat on the steps of the Art Museum which, together with the many other beautiful buildings that make up Cranbrook, is the creation of Eliel Saarinen, ranking contemporary architect who must be included among the great of all time. Below us, in the near foreground, where a string quartette entertained with soft music, Milles' heroic *Europa and the Bull* stood guard over his exquisite Triton Fountain.

Beyond the Fountain lay pools, reflecting lazy clouds, and, stretching wide like a huge ampitheatre, the expanse of the sunken, wooded greensward. In the deepening twilight, an owl skimmed low on silent wings, and a cardinal—or was it a tanager?—wove an evanescent, scarlet ribbon across the green while, overhead, swallows and nighthawks vied in aerial acrobatics.

Then, as night fell, the lights went on in the basin of the Fountain, and a pale moon, turned to silver, reflected a shimmering image in the waters. It remains, in my mind, a scene of indescribable beauty, so utterly serene and harmonious that it might well have inspired a painting of the *Garden of Allah*.

Before this backdrop, the speakers came on—Henry S. Booth, chairman of the Board of Trustees, Cranbrook Academy of Art; Francis Henry Taylor, director of the Metropolitan Museum of Art, New York, and Eliel Saarinen—each to extoll the genius of the guest of honor. And finally, Carl Milles who, in the words of Mr. Booth, had "lent the Creator a worthy hand."

And here, again, I was impressed by the quiet simplicity of men who, if they themselves disclaim greatness, nevertheless rank high in their respective fields—the directing head of one of the world's most beautiful institutions of learning, a leading connoisseur of art and custodian of a priceless art collection, and the architect and the sculptor, each outstanding in the galaxy of creative artists.

Incidentally, both of the latter are also Americans by choice, Eliel Saarinen being a native of Finland, Carl Milles of Sweden. And both, like Wm. Knudsen, have made outstanding contributions to their adopted land in superior designs for living. They are great men, yet simple, friendly men.

~ ~ ~ ~

IN THE CASE of Eliel Saarinen, it would be gross understatement to say that the architect is also an outstanding engineer. He is both; the one goes with the other. It is equally logical that the eminent sculptor should also have engineering ability, and certainly Carl Milles is richly endowed with the engineering mind. That was well impressed on me during a recent visit to his studio, as was his broad knowledge of mechanics and the finer art of bronze casting. Amazed at the all but translucent thinness of a cast figure, I hinted at metal spraying over the clay. "Metal spraying?" He shook his head. "Ah no, that is not art."

One thing that enhances the sublime quality of his work is that his creations are not things of clay or bronze; they are alive, have personalities! "He," indicating. "was a dear friend, and here," gently, "the Vagabond. Of them all, I think I liked the Vagabond the best." And so they live, these friends of his—for the ages.

Andy

* See Hans Christian Anderson's: *When Holger Danske Wakes.*

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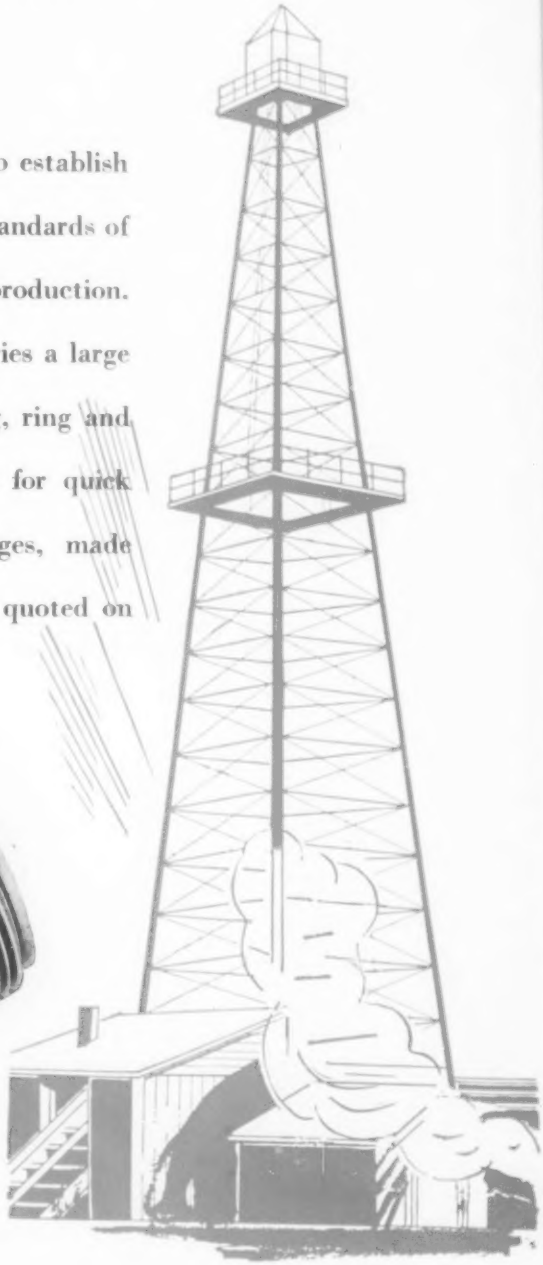

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These specimens consist of 10 *metal* samples, which represent 25 sample surfaces. They not only save hours and eliminate uncertainty, but often reduce production costs by enabling operators to avoid making unnecessarily smooth surface finishes.

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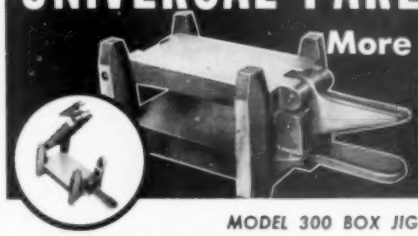
UNIVERSAL PARLEC JIGS

More Production WITH LESS MAN HOURS



MODEL 300 BOX JIG OPEN AND CLOSED

Box Type Jig in six sizes – Jig Frame and Cover finished top, bottom, and both sides. Base also finished.

To make ready, locate part on base, add side plates if drilling sides, install bushings and clamps. No wasted time and fast operating.

. . . Master Layouts giving exact specifications on request . . .

- **Saves Tool Designers' Time**
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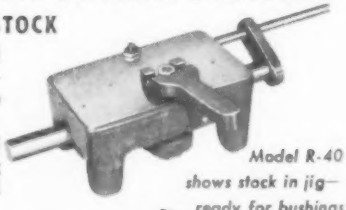
STANDARDIZE AND STOCK UNIVERSAL'S DRILL JIGS

ADJUSTABLE ROUND STOCK DRILL JIG . . . Round Stock Jig in three sizes. – Will handle from ¼" to 2" Stock.

To make ready, add bushings, set equalizing clamp by lock nuts, and adjust stop.



Model R-40 shows stock in jig— ready for bushings

Universal's Jigs are being used by hundreds of manufacturers.

MODELS FROM $19.25 to $31.75 IMMEDIATE DELIVERY

UNIVERSAL TOOL CO.

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ICE CETTIN'! THANK YOU SIR!
Carbide tools should have just enough
provide free cutting action, AND NO
Otherwise you weaken the cutting edg
cutting point exactly at the height
WHEN GRINDING DONT USE TOO MUCH FORCE
HELP!
Don't exert too much pressure against the abrasive wheel when grinding carbide tools. If the wheel is right, light pressure will remove metal
suitable rate. Too much pressure
heating and may
BE SURE TO USE THE PROPER TOOL!
FOR SIZE
FOR SHAPE
FOR STYLE
FOR TIP
Carbide tools operate at higher speeds th
other metal-cutting tools. Carbide tools
always be larger than the steel or alloy
they replace. Also, make sure they are
correct style, shape, and grade.
FIRTH-STERLING STEEL COMPANY
GRIND 'EM PROPERLY!
TOOL GRINDING RULES
Grinding rules for carbide tools are easily avail-
able and should be followed carefully. The right
wheel, running in the right direction, preserving
correct angles are some of the things to watch.
Don't guess—grind carbide tools according to rules.
FIRTH-STERLING STEEL COMPANY
FIRTHITE

The conservation of carbide tools through proper handling and correct usage is essential not only in war time but at any time for best production results and low operating costs.

These Firthite field service posters will help remind your plant operators in simple, easy-to-take, understandable manner, of the right way to make carbide tools do their utmost.

Fill in and mail the coupon for your set of these free, 17" x 22", four-color posters.

Firth-Sterling
STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

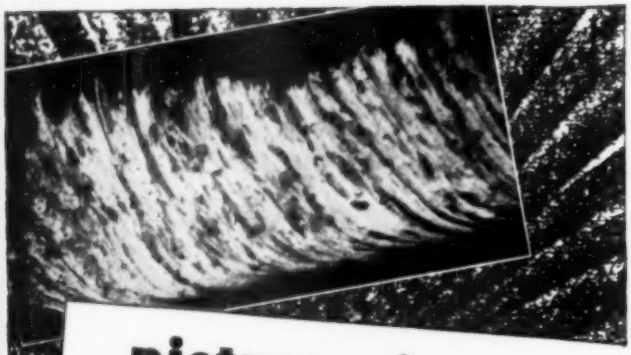
FIRTH-STERLING STEEL CO., Dept. TE—McKeesport, Pa.

Please send us without obligation on our part _____ sets of Firthite Field Service Posters which we wish to display in our plant shops.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____



picture of a

"Frozen Explosion"*

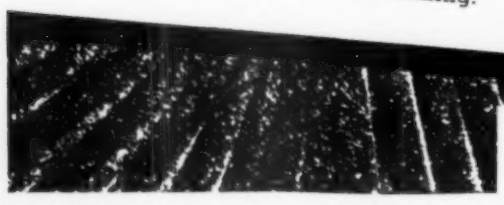
*Photomicrograph of metal chip

● When metal is machined, pressures between the moving body of the piece being machined and the tool edge develop elastic and/or plastic forces *within the workpiece.* The release of these forces literally *explodes* successive portions of metal, sending them streaming forth in the form which we call a chip.

Metal-cutting is a matter of metal behavior and flow, in which complex process the cutting fluid regulates temperature, lubricates rubbing surfaces, prevents welding, and possibly dampens vibrations.

Stuart men are skilled in attaining the most favorable balance of these qualities in cutting fluids, both in the lab and on your machines.

For further information on the mechanics of metal-cutting, write for your free copy of Stuart's 60-page booklet, "Cutting Fluids for Better Machining."



D.A. Stuart Oil CO. LIMITED

ESTABLISHED 1865

Stocks in Principal Metal-Working Centers

POWER FEED
For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading.

Pat. No. 2,356,651

For Jig Borer, Drill Press, Milling Machine

● ALL OPERATIONS IN ONE SET-UP

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phospher bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.

514 OHIO AVE. MUNCIE, IND.

TOOLS
PRECISION MADE

CONOMY DRILL JIG BUSHINGS and GAGES

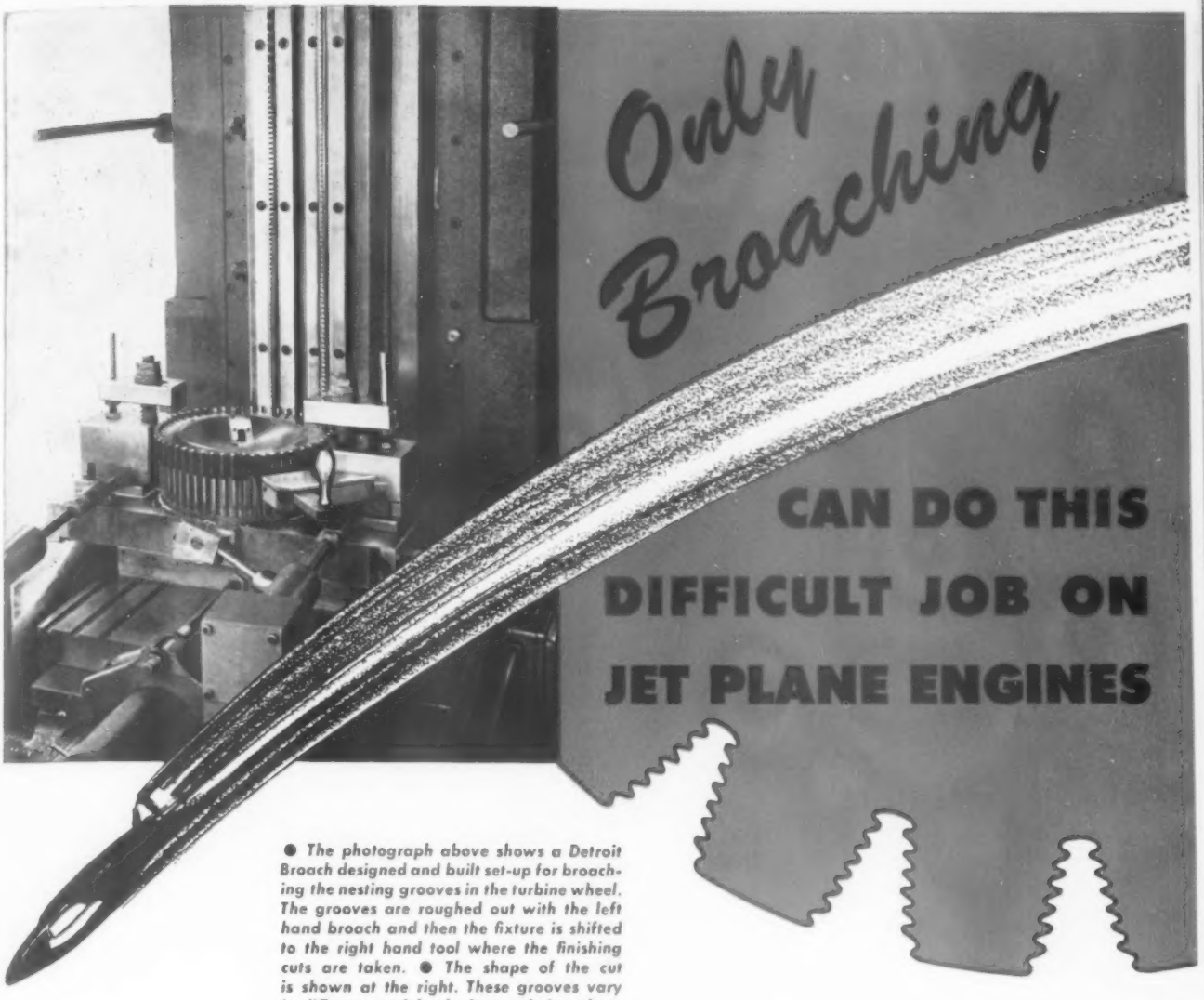
will promote greater efficiency and accuracy in your present and post-war production standards.

UNDERSIZE GAGES restored to active service, at a minimum cost, by hard chrome plating and refinishing to original sizes.

Write today for particulars

ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN



Only Broaching CAN DO THIS DIFFICULT JOB ON JET PLANE ENGINES

● The photograph above shows a Detroit Broach designed and built set-up for broaching the nesting grooves in the turbine wheel. The grooves are roughed out with the left hand broach and then the fixture is shifted to the right hand tool where the finishing cuts are taken. ● The shape of the cut is shown at the right. These grooves vary in different models, the largest being about an inch deep and three-quarters of an inch wide at the base.

● The grooves that hold the buckets to the turbine wheel in our newest jet plane engines must be smooth and accurate beyond even the great smoothness and accuracy demanded by other precision war products because of the high stresses and tremendous speeds encountered in this type of engine. ● The only practical method of cutting these grooves is by broaching. No other process offers the speed, the accuracy, the fine finish that is obtained with broaches. Few peace-time products require such close adherence to specifications but in any peace-time product more speed means lower cost, more accuracy means a better product, better finish means better appearance, more sales. Call in a Detroit Broach engineer now, while you are planning new products. He will give you complete cost and production data on your own job without obligation.

ARMY (E) NAVY

MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

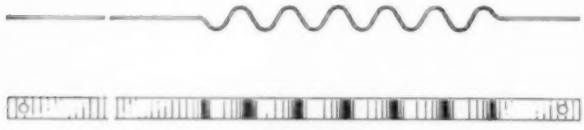
20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN
9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIF.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

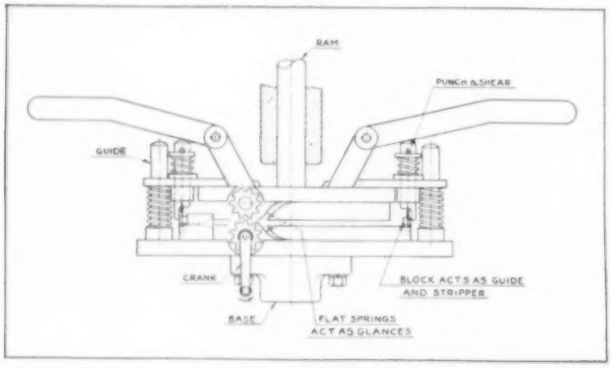
Combined "Crinkler" and Die

WHILE THE PROBLEM in this instance was to form a crinkle type flat spring of uniform length, pierced at a given distance between centers, the "gadget" used suggests other applications. For example, it is adaptable to jobs for which stock tools are not readily available and where quantity does not warrant a large investment.



The Product

The crinkle was formed by duplicating the contour on two matching gears, with allowance for stock thickness. The half crinkles at each end, which center the crinkle on the spring, are duplicated on the gears and act as stops in each direction when the gears are rolled. Two flat springs act as glances as the stock is fed through by rolling the gears.



The Tool

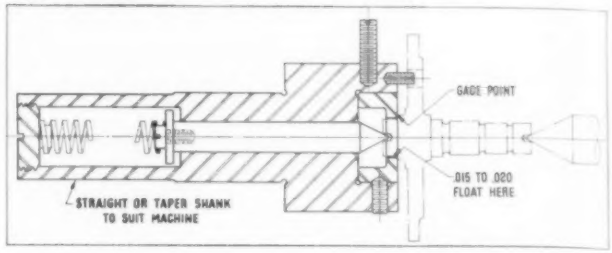
The punches are set at the specified centers, and the strippers act as guides for the stock and pilots for the punches. The shears, which operate integral with the punches, trim the springs to length and insure that their length and the proper location of the holes in each spring will be exactly alike.

While the procedures of operation may be somewhat confusing, due to the tool being shown in side elevation only, it is all very simple—and, it may be added, very efficient. The tool is used in combination with a foot—or kick—press, the descending ram of which meshes the gears after the stock is placed in position. The assembly is then in "shut" position, when the gears are rolled by a hand crank, forming the crinkle. The shears and punches are actuated by a sharp blow on the two levers, shown at each end of the assembly. As the ram of the press ascends, springs open the assembly and raise the punches for entry of the next piece.

Taking these operations in sequence, the spring stock is located against a stop, with the gears open. The ram then descends, meshing the gears, both of which have odd stub teeth which form the half crinkle at each end. The gears are next rolled an incomplete circle, which completes the crinkle. Next, the ram ascends, when the crinkle spring is placed under the combined shears and punches, which pierce and trim.

Donald Marten
Boston Chapter, A.S.T.E.

Spring Center Driver



THE RATHER INEXPENSIVE yet efficient tool, shown above, provides for the accurate facing of shoulders to length. It can also be used for grinding tapers in respect to shoulders.

The shoulder of the part gages on the face of a collar insert, this insert having a bore of .015" to .020" larger than the entering diameter of the workpiece. This allows the spring loaded center to accurately locate the workpiece for center alignment, without bind or cramp.

The shank (shown straight here) can be machined straight or taper, to suit machine being used, while drives would also be located to suit the workpiece.

Paul R. Weitzman
Fort Wayne Chapter, ASTE.

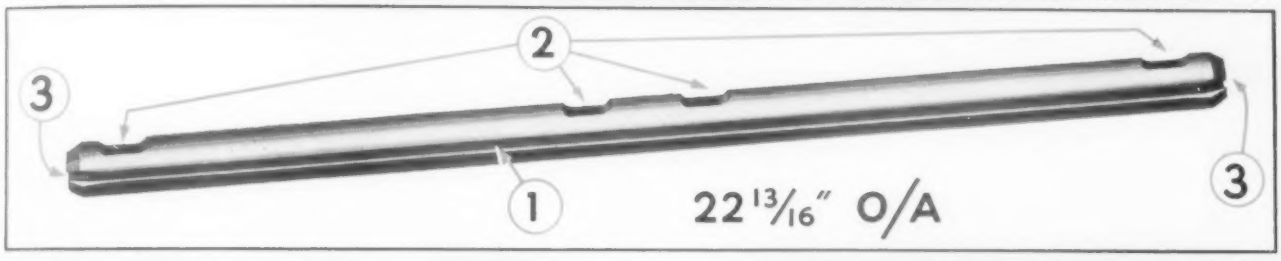
Solid Center Driver

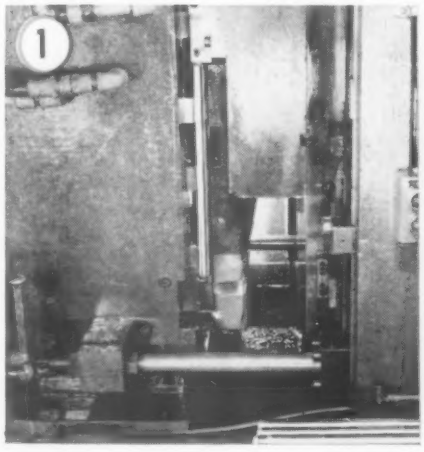
THE COMBINED CENTER AND DOG, shown in the photograph, has been found particularly suitable for turning large bolts at General Electric's Pittsfield Works. The bolts are ground subsequent to turning, hence, must be centered both ends anyway. The shank of the tool fits the headstock spindle of a lathe, and two off-center set screws, which may be long or short as required, act as drivers.

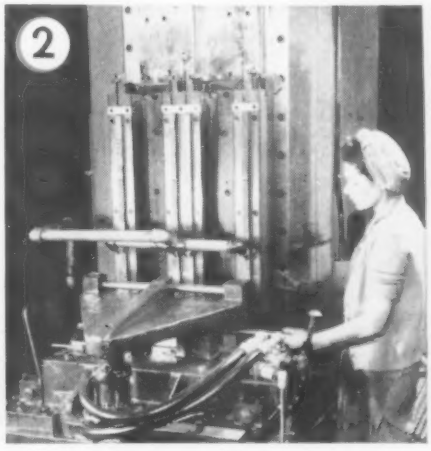
Through its use, handling time has been cut in half, with a consequent increase in production. In addition, the tool is quickly mounted and demounted, takes up very little storage space and is always ready. Also, since the screws may be flush with the O.D., it is safe; however, a guard ring can be incorporated for added safety. It can be varied to accommodate a very large variety of work, the only requisite being an asymmetrical head on the part being turned.

Courtesy,
General Electric Company

How *3* broaching operations on *3* machines produced *4000* tank track pins per day!







A well known Michigan manufacturer, short of broaching machines and short of help, but confronted with a difficult and urgent tank pin and bushing assignment, took its problem to U. S. Broach. A quota of 4000 pins per day had to be met. Milling would have been much too slow. Broaching was the answer—and *all three operations were broached* and the *quota exceeded* with inexperienced help.

OPERATION No. 1 broached 2 angular slots the full length of this $22\frac{13}{16}$" pin. This was accomplished by cutting two slots in two pins at one stroke of the ram, equal to two finished pins per stroke.

OPERATION No. 2 required one fixture to do one pin at a time. Pins were loaded from one side and located from the inverted slots in order to insure the proper angular relation between slots and flats. Pins were firmly held with hydraulic clamps.

OPERATION No. 3 broached a leading chamfer in each end of the longitudinal slots. Four pins were located in the fixture at one time, as shown above, rotated 180 deg. to complete chamfer on one end, then turned end for end to complete opposite chamfer.

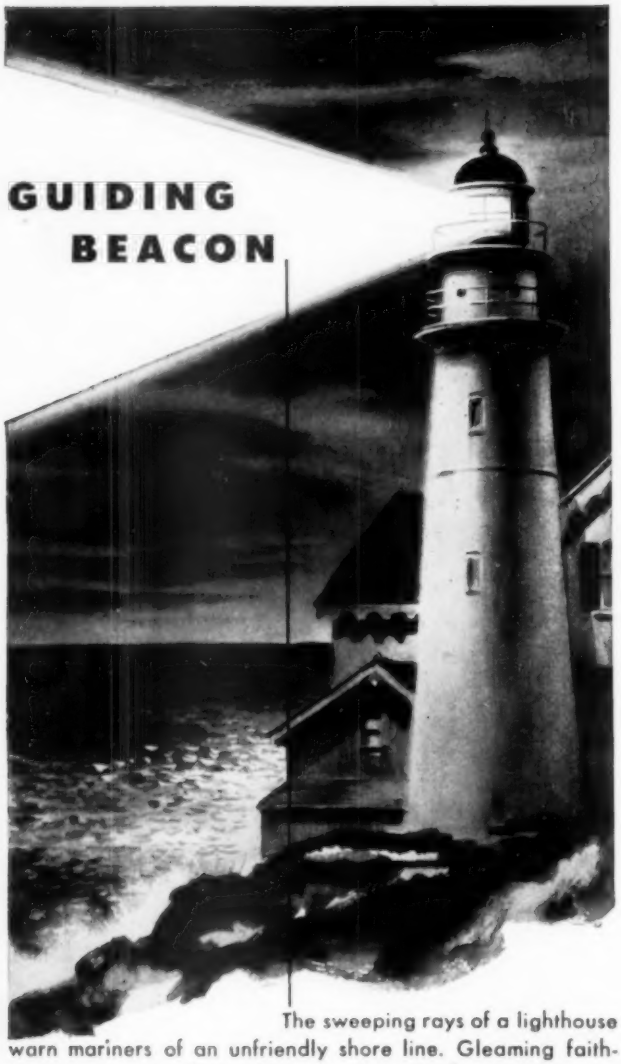
U.S. BROACH Company

USB

6468 E. SEVEN MILE RD. DETROIT 12, MICH.

BROACHING TOOL

TELEPHONE TWINBROOK 1-2211



The sweeping rays of a lighthouse warn mariners of an unfriendly shore line. Gleaming faithfully, it measures their progress and marks their safety.

For more than a decade Pioneer Engineering has warned some of America's most important manufacturers of the shoals and reefs of industrial trouble . . . guided them through the fogs of production difficulties . . . aided them to steer a straight course through the unfamiliar and troubled waters of war time conversion.

When the pursuits of peace are resumed, the friendly beacon of Pioneer's experience and skill will light the return voyage for numerous organizations. Even now, Pioneer is working shoulder to shoulder with many executives in an effort to "blueprint" the future . . . predicting . . . prescribing . . . preparing, as far as humanly possible, to meet tomorrow's problems.

The most adequately staffed industrial engineering firm in the United States, Pioneer can furnish the combination of trained manpower exactly suited to your needs. One man—or hundreds—available for consultation now. You will find your situation analyzed and acted upon . . . your problems surveyed and solved . . . with efficiency and dispatch.

PIONEER ENGINEERING
AND
MANUFACTURING COMPANY
1345 JOHN R ST. • DETROIT 3, MICH.

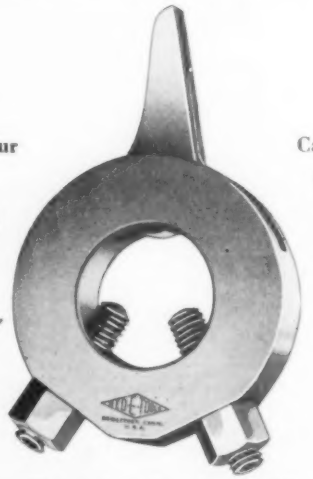
- You want the best to be had, that goes without saying.
- We provide it, consistently.
- Carbide tipped or high speed steel cutters, drills, reamers, specials, reworked and guaranteed.
- Tool salvage is not an expense, it is a profit.

National Tool Salvage Company
6511 Epworth Blvd., Detroit 10, Mich.

EASY TO ADJUST!
QUICK IN ACTION!

REDE **CAM ACTION GRINDER DOG**

Made in Four Sizes to Take All Sizes of Work From ¼"-2"

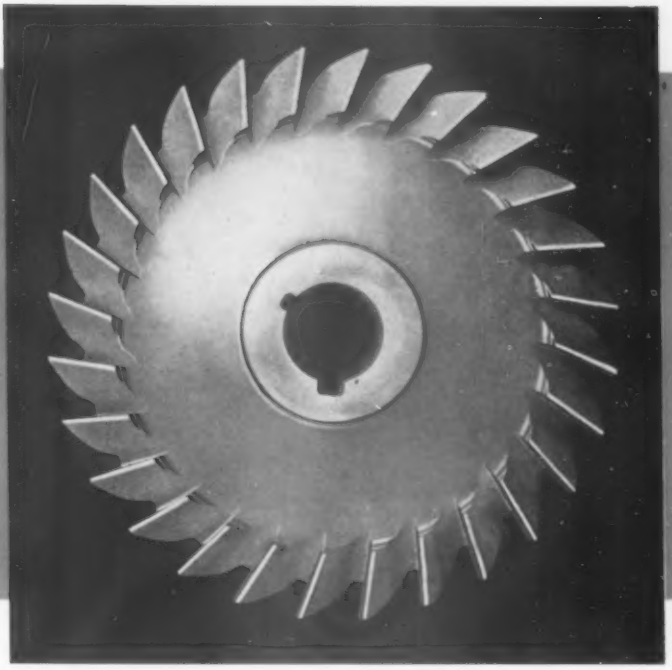


Can Not Slip Concealed Spring Holds Cam To Work

Write for Catalog E-45

The Ready Tool Company
550 Ironistan Ave.
Bridgeport Conn.

What Is CUTTER LIFE?



MODERN AUTOMOBILES were built to get 100,000 miles. Some drivers get much more, others a great deal less.

Cutter life is identical to automobile life. The better care they receive, the longer they last, the more production you get, and the more profits for you.

Take new cutters for instance. If you have been in the habit of working them until they are worn out and then discarding them as scrap, you've been extremely wasteful. If you have been attempting to recut them in your own shop, it's a sure bet that you have only done half the cost-saving job that it is possible to do.

EXPERT HIGH-SPEED TOOL RECUTTING AND CONDITIONING needs a HIGHLY Specialized Trained staff of Tool Engineers and unless your tools are recut at regular intervals together with a scientifically equipped shop, you are not getting the most out of your cutters.

Most high-speed tools can be recut many times. We have recut cutters a dozen times to give the same service as 12 new cutters. Think of the saving in tool costs.

Entrust the care of your cutters to your "Eastern Cutter Service Engineer" to get longer cutter life and more profits. Just call us and we'll gladly tell you how.

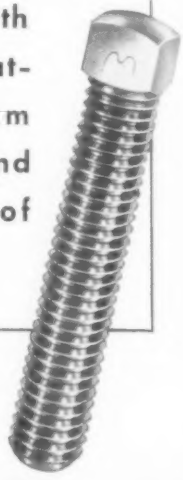
For valuable tips on tool care and tool conservation, write for our new 32 page catalog on "Tools, Recut, Reconditioned and Converted."

EASTERN CUTTER CORPORATION

30-32 LITTLETON AVE. NEWARK 7, NEW JERSEY

Need extra GRIPPING POWER? Specify *Mac-its*

Mac-it alloy steel square head set screws are milled from the solid bar with die-cut threads. Heat-treated for maximum torsional strength and to resist upsetting of the points.



Mac-it Products Include: Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

STRONG, CARLISLE & HAMMOND CO. • *Cleveland 13, O.*

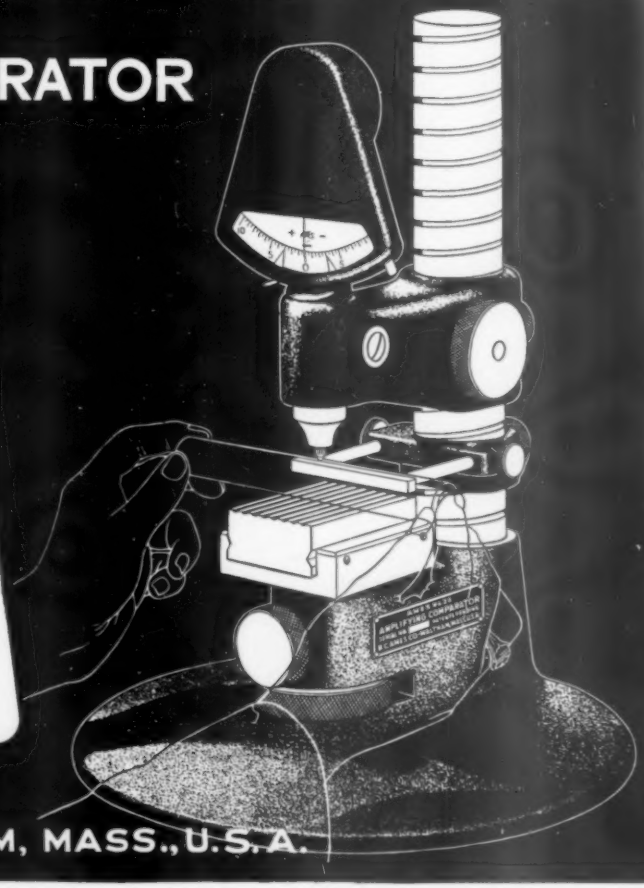
AMES No. 26 COMPARATOR

This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings.

The cast iron base supports the steel upright column, which is grooved to provide an adjustable stop for the indicator bracket. Fine adjustment of indicator is made by moving dial with outside lever. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

SPECIFICATIONS

Total height 15". Base diameter 11".
Total measuring capacity 6"
Fan Head total range .002"
Distance from contact to front of Post 3½"
Anvils 2⅛" x 3¼". Special anvils to order
Approximate weight 40 pounds



B. C. AMES CO., WALTHAM, MASS., U.S.A.

Let us DEMONSTRATE

PATENT PENDING

HERMAN Precision Granite SURFACE PLATES

ACCURACY to 1/10,000 inch

WE INVITE YOU to write for specific data on a shop test of Herman Precision Granite Plates in your own plant at our expense. Then you can observe for yourself why these smooth, hard, warp-proof surface plates, cut from blocks of natural granite, are used by so many nationally known firms.

Flatness that Stays Flat

Millions of years of natural aging are important in the permanent accuracy of Herman Precision Granite Surface Plates. Absence of internal strain eliminates any chance of warping.

Non-Abrasive, Non-Magnetic

Filings and emery dust are easily brushed off the non-magnetic granite surface, saving production time and costly cleaning. It is unnecessary to de-magnetize any material before testing on a Herman Precision Granite Surface Plate. For layout and toolroom work, inspection and checking of work demanding the most exacting tolerances, you will find Herman Precision Granite Surface Plates most practical . . . most economical. They do not "lapp" height gauges and "Joe blocks" because the granite surface does not become "charged."

Write today for descriptive literature, and information on a shop test.

Nationally Known Users of HERMAN GRANITE SURFACE PLATES

Westinghouse Electric	Crosley Radio	Bendix Radio	General Motors	Curtiss Wright
Chrysler Motors	Allis-Chalmers	General Electric	Bausch & Lomb	International Harvester

Write for authoritative Government report on the use of these photos.

The Herman Stone Co.

Dept. T, Harries Building, Dayton 2, Ohio

...cut floor-to-floor time to 12 seconds.....

Tapping an .800-16 Class-3 fit thread to a critical depth of exactly 5/8 inch from the nose of a smoke shell and concentric with the bourrelet of the shell, in 12 seconds each, floor to floor, is the job being done by the Detroit Tap & Tool Company engineered installation shown here.

Taking advantage of the light weight of the shell, permitting its handling with one hand, "Detroit" engineers designed a simple fixture which locates and clamps the smoke shell both concentrically with the tap spindle and to exact height of the shell nose—*with but a single movement of one lever.*

Thus, loading and unloading time was cut to the minimum possible, taking maximum advantage of the ability of the Detroit LTM lead-screw type tapping machine to turn out more accurate work in greater production. The drive to the tap in these machines is at the base of the lead-screw, eliminating wind-up and permitting fast return with greater thread accuracy.

For further details, ask for Bulletin LTM-44.

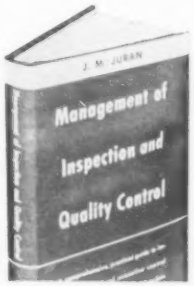
BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A.

GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press



Management Inspection of Quality Control, is a book by J. M. Juran, formerly Chief of Inspection Control Division, Western Electric Company. It covers both the management functions which support and operate good inspection, and the operating methods within departments in conducting inspection work.

Technical details are presented in non-technical manner, and mathematical methods in equally simple, non-mathematical terms. Published by Harper & Brothers, 49 East 33rd St., New York 16, N. Y.

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Cartels Threaten American Enterprise, an article by J. Howard Pew, president of Sun Oil Company, defines cartels and their threat to American competitive enterprise, and suggests ways to combat them. In June 1945, *Industrial Marketing.*

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Which Auxiliary Power—Electric or Hydraulic? An article by Col. T. B. Holliday, Assistant Chief of the Air Corps Equipment Laboratory Engineering Division, outlines the types of auxiliary equipment used on modern military planes and the reasons which dictate final choice between electric, hydraulic, pneumatic, mechanical or chemical actuation. *Machine Design,* June, 1945.

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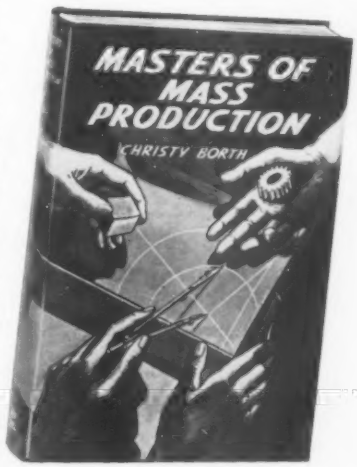

Masters of Mass Production, by Christy Borth, of Detroit, is at once a fascinating and dramatic story of the galaxy in the industrial firmament which has made possible this nation's magnificent record in mass production.

The book is of especial interest to tool engineers, and particularly to A.S.T.E. members, in that mention includes at least one past president of the Society—Frank Shuler—and many others who have been prominent in A.S.T.E. as well as national activities.

Taken as a whole, it is a saga of "gadget makers" who, in time of national emergency, pooled their Know-How and ingenuity in the interest of patriotism. Published by the Bobbs-Merrill Company, of Indianapolis and New York, it is a poignant story of men more proficient in work than with words, of men whose slogan was *results*—and who achieved results!

~ ~ ~ ~

Precision Bevel Gears Cut Quickly is the title of an article by Ernest Wildhaber of the Gleason Works, describing the Revacycle process. A large circular disk cutter roughs and finishes a tooth space in a single revolution. A gap in the cutter teeth permits indexing the gear blank, thus providing continuous or cycle operation. *American Machinist,* June 7, 1945.

~ ~ ~ ~

Science of Measurement is the general title of an 8 lesson home study course offered by the DoAll Division of Continental Machines, Inc., Minneapolis 4, Minn. Up-to-date information of everything connected with precision measurement is presented under the following subjects: Progress in Precision; Inspection and Care of Gage Blocks; Use of Gage Blocks; Accessories of Precision; the Sine Bar and Its Uses; Measuring to a Millionth with Optical Flates; the DoAll Comparator and Threads and Gears; and the Mobile Inspection Unit and How to Set Up a System.

The Autobiography of Science, edited by Forest Ray Moulton and Justus J. Schifferes and published by Doubleday, Doran and Company, Garden City, N. Y., traces the development of major sciences such as medicine, biology, chemistry, physics, astronomy, optics, botany, genetics, anthropology, geology, aeronautics, psychology and many related subjects.

~ ~ ~ ~

High Strength Steels Pace Lightweight Development, by F. D. Foote of Alloys Development Corp., Pittsburgh, outlines some of the latest industrial uses for light weight, low alloy, high strength steels, and compares their mechanical properties with those of ordinary structural steels commonly used today. The *Iron Age,* June 14, 1945.

~ ~ ~ ~

The Engineering Approach to Machine Tool Selection, an article by Edwin Laird Cady written as an aid to engineers in assuming fuller responsibilities through better overall production planning, better selection of machine tools, better machine tool design, and better machine tool use and operation—in short, through better all around engineering. In June, 1945, *Metals and Alloys.*

~ ~ ~ ~

Basic Methods of Thread Grinding describes modern practice in grinding threads either as a finishing operation or in cutting "from the solid." Types of grinding wheels, wheel speeds and work speeds, and truing of wheels are covered. Written by W. J. Grimm, manager Thread Tool Division, Jones & Lamson Machine Co., Springfield, Vt., this article appeared in *Machinery,* June, 1945.

Bulletins and Trade Literature

Items briefed herein have been carefully selected for their interest and application. All are available, on request, from the stated sources.

Among recent GENERAL ELECTRIC COMPANY (Schenectady, N. Y.) bulletins are included the following: *Sintered-Alnico Magnets; How to Repair Tractor Parts by Arc Welding; Motors and Controls for Hazardous Locations;* and *G.E. Tachometers for Measuring Speed.*

~ ~ ~ ~

KOEBEL DIAMOND TOOL COMPANY, Ltd., Windsor, Ont., has issued a new Canadian Bulletin—*Diamond Tools*—so illustrated and indexed that the buyer may readily locate a desired tool. In response to popular demand for reprints, the Koebel firm has reissued its popular book: *For Grinder Men Only.*

~ ~ ~ ~

PRATT & WHITNEY Division, Niles-Bemont-Pond Company, West Hartford 7, Ct., has issued a new and what is said to be an exceptional catalog covering *Kellerflex Shaft Machines and Equipment.*

~ ~ ~ ~

NORTON COMPANY, Worcester 6, Mass., has issued folders on new *Grinding Wheel Markings,* covering markings on the various Norton abrasive and diamond wheels, as well as conversion from the old to the new markings.

~ ~ ~ ~

MACKLIN COMPANY, Jackson, Mich., has issued two new catalogues—No. 44, covering *Sharpening Stones,* and No. C-4, covering *Macklin Grinding Wheels.*

~ ~ ~ ~

CARPENTER STEEL COMPANY, 322 West Bern St., Reading, Pa., provides the answers to the selection of *Air Hardening Tool Steel* in a descriptive folder.

~ ~ ~ ~

FEDERAL PRODUCTS CORPORATION, 1144 Eddy Street, Providence 1, R. I., has issued a Bulletin describing two new Federal gages which have created considerable interest. One is a *Dial Indicator Snap Gage,* the other a *Micrometer Computator.*

~ ~ ~ ~

HARDINGE BROTHERS, INC., Elmira, N. Y., have issued a bulletin covering *Hardinge Master Feed Fingers with Adjustable Tension.* The bulletin includes information on *Biox and DA-2X Adjustable Tension Masters for No. 00G Brown & Sharpe Machines and Davenport Automatics,* respectively, as well as those featured in the original Bulletin.

~ ~ ~ ~

THE DRIV-LOK PIN COMPANY, 565 Washington Blvd., Chicago 6, Ill., has issued an 8-page bulletin describing its several styles of *Self-Locking Drive Pins.* In addition, there are tables of sizes and two pages of typical applications.

~ ~ ~ ~

Because of inquiries for information on *Homo Method for Nitriding-Homocarb Method for Carburizing, and Vapocarb-Hump Heat Treating of Steel,* full information on these processes is made available in bulletin form by LEEDS & NORTHRUP CO., 4907 Stanton Ave., Philadelphia 44, Pa.

~ ~ ~ ~

An informative 8-page comparison chart of *Welding Electrodes* has recently been released by ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wisc. The chart—B-6344A—compares equipment from 22 electrode manufacturers, and contains information on stainless steel and hard surfacing electrodes as well as the mild steel type.

Bulletin No. M-100-145, available from the SHEFFIELD CORPORATION, Dayton 1, Ohio, tells about the quick and accurate *Grinding of Threads and Forms with the Multi-Form Wheel on the Sheffield Precision Thread and Form Grinders.*

~ ~ ~ ~

DETROIT MOLD ENGINEERING CO., 6686 E. McNichols Road, Detroit 12, Michigan, issues a monthly bulletin—DME News—which gives pertinent information on *Molds Sets for Plastics.* They are available to anyone engaged in the manufacture of plastic products.

~ ~ ~ ~

An 8-page pamphlet, recently issued by E. I. DU PONT DE NEMOURS & CO., Plastics Dept., Arlington, N. J., provides a *Digest of Plastics* manufactured by Du Pont—their forms, properties and applications.

~ ~ ~ ~

TUNGSTEN CARBIDE TOOL COMPANY, 2661 Joy Road, Detroit 6, Michigan, has issued Bulletin No. 115, describing both *"Convertible" Carbide Tipped and Solid Boring Tools.* Both types of boring tools are standard in Carboloy grades 78, 831, 883, and 905.

~ ~ ~ ~

JOHNSON GAGE COMPANY, Bloomfield, Conn., is issuing a series of pamphlets on *Thread Gaging* and subjects relating to *Quality Control* of manufactured products.

~ ~ ~ ~

MICHIGAN TOOL COMPANY, 7171 E. McNichols Road, Detroit 12, has issued Bulletin No. 900-44, which describes the improved *Model 900 Rack Type Gear Finishing Machine.* This machine operates on the well-known "Michigan" crossed-axis gear shaving principle, and will handle either spur or helical gears from 1″ to 8″ pitch diameter and up to 2″ face width.

~ ~ ~ ~

A new line of stickers, called *Kum-Kleen,* and widely applicable, is described in bulletins issued by AVERY ADHESIVES, 451 E. 3rd Street, Los Angeles 13, Calif. These stickers are particularly applicable to plant layouts.

~ ~ ~ ~

A new bulletin, which describes an accurate mechanical process, called *Roto-Finish, for De-burring and Finishing Metal Parts,* has recently been released by THE STURGIS PRODUCTS CO., Sturgis, Mich.

~ ~ ~ ~

ROCKFORD MAGNETIC PRODUCTS COMPANY, Rockford, Ill., presents a new catalog on *Power-Grip* holding devices. These include *Magnetic Chucks and Holding Devices,* as well as *Lifetime Magnets.*

~ ~ ~ ~

ERICKSON TOOLS, division of Erickson Steel Company, 2309 Hamilton Ave., Cleveland 14, has released a new set of Data Sheets on its line of *Precision Holding Tools.*

~ ~ ~ ~

AMPLEX DIVISION of Chrysler Corporation, 6501 Harper, Detroit 31, has issued a new 168-page *Oilite Catalog* of Powdered Metal Parts. It is replete with engineering and application data.

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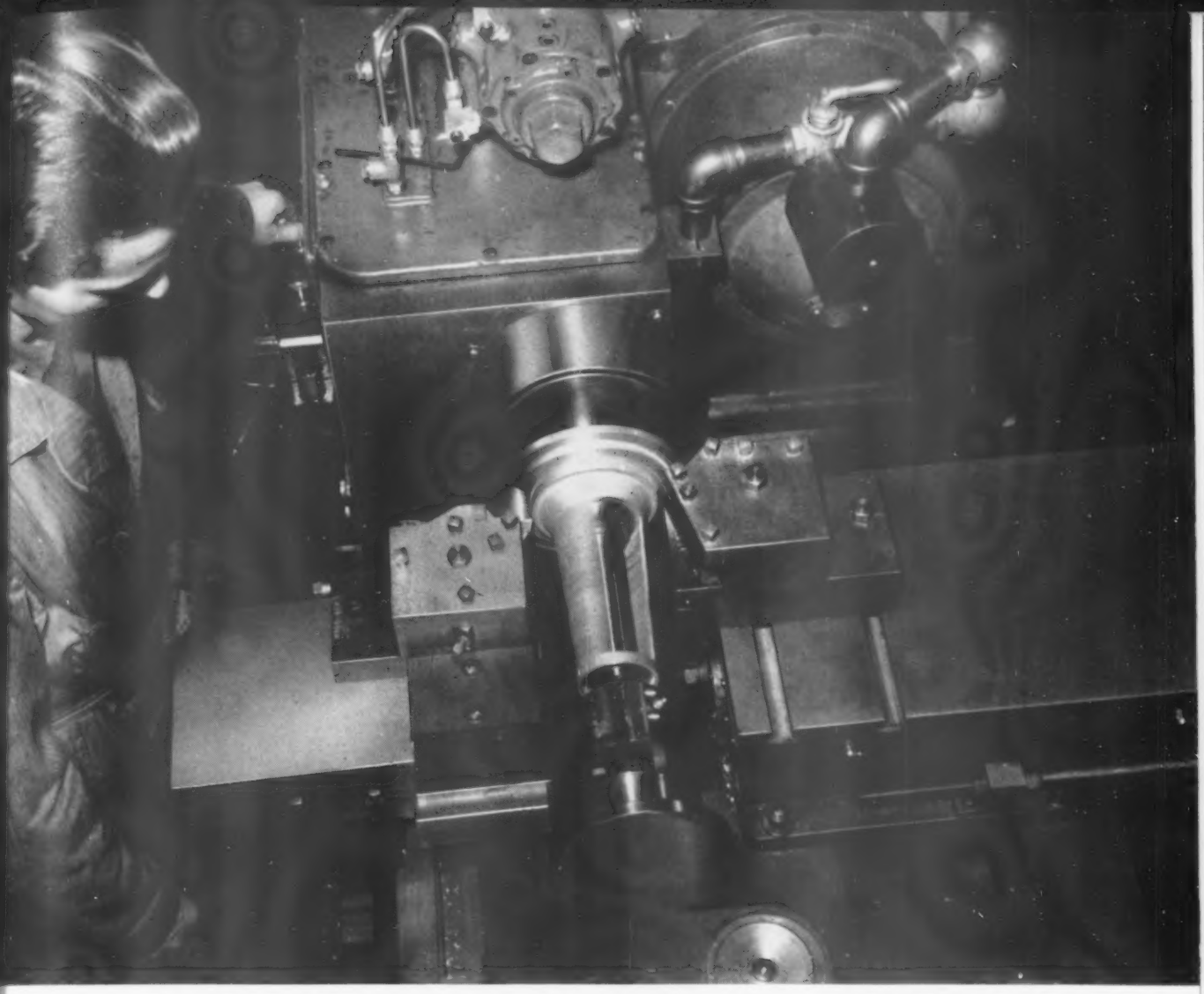
COLONIAL TOOL COMPANY, Ltd., Windsor, Ont., has issued a striking Booklet—No. E-4S—describing the Colonial line of *Rotary and Rack Type Gear Finishing Cutters.*



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ACTUALLY "double duty" is ultra-conservative for the production ability of this automatic lathe. For it can out-produce two, three, or even four manually operated machines wherever parts are to be turned out in large quantities.

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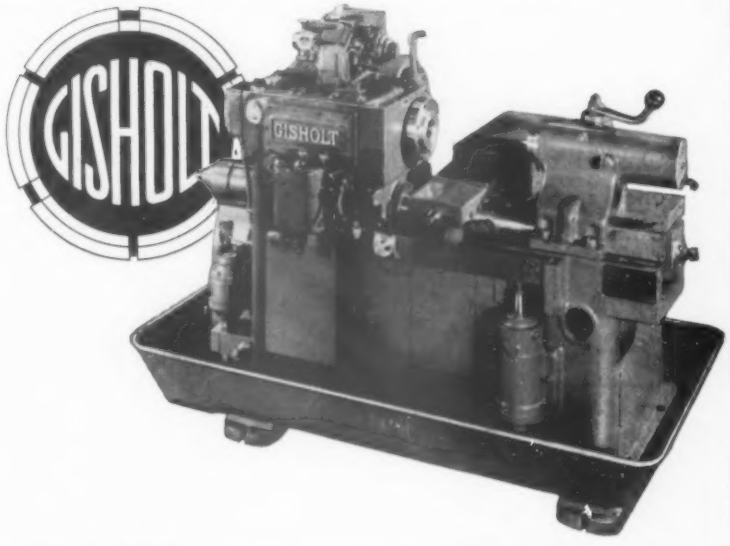

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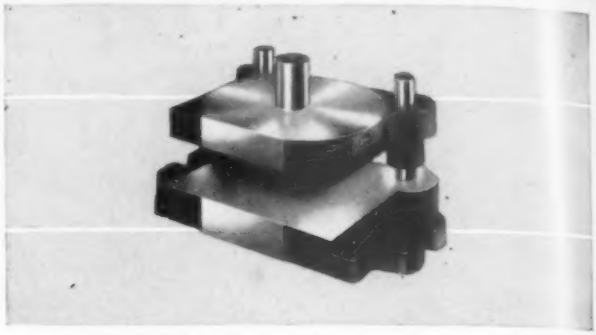

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Vital Conference To Be Held In Canada

Announced by the Combined Production and Resources Board as we go to press, a conference of vital importance to the industries of the United States, Canada and Great Britain will be held in Canada this fall. At this meeting, long-standing differences in Anglo-American engineering practices and standards of measurement, which have impeded war production, will be discussed.

It has been estimated that, in the design of screw threads alone, differences between American and British standards have added at least $100,000,000 to the cost of the war. The fall conference is intended to reduce such differences.

A steering committee, which has already met under auspices of CPRB, has drawn up an agenda covering unification of engineering standards, screw threads, pipe threads for use in aircraft and other fuel and gas lines. The agenda will also include limits and fits which affect the practice of most engineering firms, and drafting practice, on which depends the intelligibility of drawings to engineers on both sides of the Atlantic. It will further include the standardization of accuracy of measuring tools such as micrometers, vernier calipers and dial gages for which CPRB claims that there are no standards in the United States or Canada, although it is said that there is an inclusive set of standards in the United Kingdom.

Canada, which is to be host to the Conference, is sending representatives of the Canadian Government, the Canadian Standards Association, and the National Research Council in addition to representatives from the automotive industry and other industries concerned with production of screw threads.

The United Kingdom delegation is to be composed of two representatives of the British Standards Institution, which has the support of engineering industries together with Government and industrial representatives.

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Tracer-Controlled MILLING

Automatic *Rotation PROFILING

* WORK and MASTER **ROTATE** with TABLE MOVEMENT

CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" stock, merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

PRODUCTION DATA

Material—S.A.E. 1020 Seamless Steel Tubing.
Operation—Rough and Finish Milling of 10 Wells (varying from 3/4" wide x 3/8" long . . . to 3 5/8" wide x 2" long), .062" deep.
Cylinders—9 9/16" O.D. x 7 25/32" long.
Feed—Manual . . . Spindle Speed—4,000 r.p.m.
Tolerances—±.005".
Time—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

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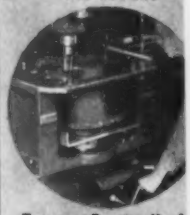
Have the advantage of 50 years of Gorton Specialized Tracer Control Experience in your shop—call nearest Gorton dealer or write to Gorton factory at Racine, Wisconsin.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton DIE BLOCKS



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Tracer-Controlled DUPLICATING

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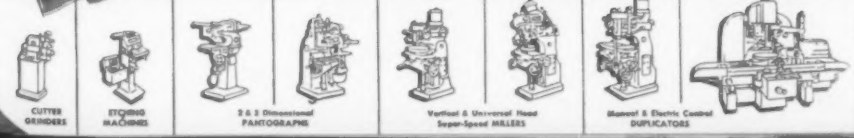
Tracer-Controlled ETCHING

GORTON *Precision* MACHINES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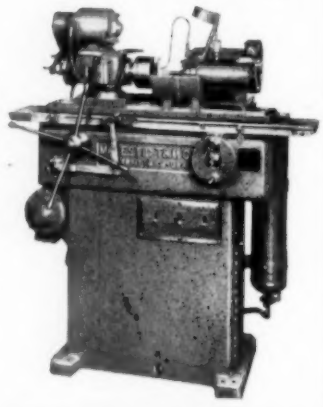

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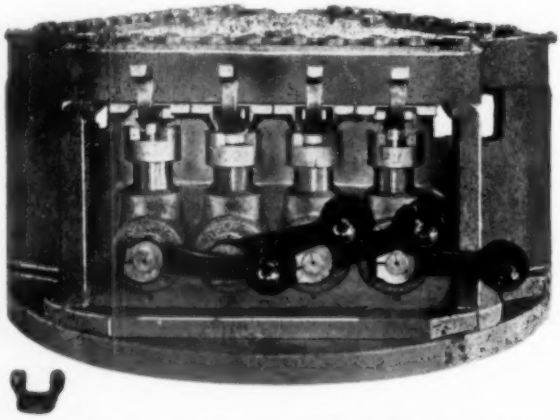
Training Text For Welders

"Spotwelding Takes to the Air" is the title of a training text on spotwelding prepared for use in the Curtiss-Wright training department. The author, Henry T. Yaeger, is a process engineer at the Kenmore Plant, C-W Airplane Div., and developed the book to meet an urgent demand for Know-How, especially as no other suitable text existed.

The book is written in clear, understandable, lay English, and is profusely illustrated. Chapter headings include "Chemical Cleaning," "Testing for Shear Strength," and "Good Welds and Bad;" and every phase of the subject to the final discussion of the "future of spotwelding" is graphically illustrated. The book, a real contribution to the art of spotwelding, was sponsored, edited and published by the Training Department of Curtiss-Wright's Kenmore Plant.



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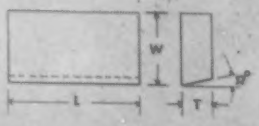

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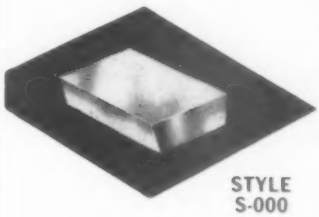

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Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a wide-spread, yet economical scale, the advantages of Kennametal—its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

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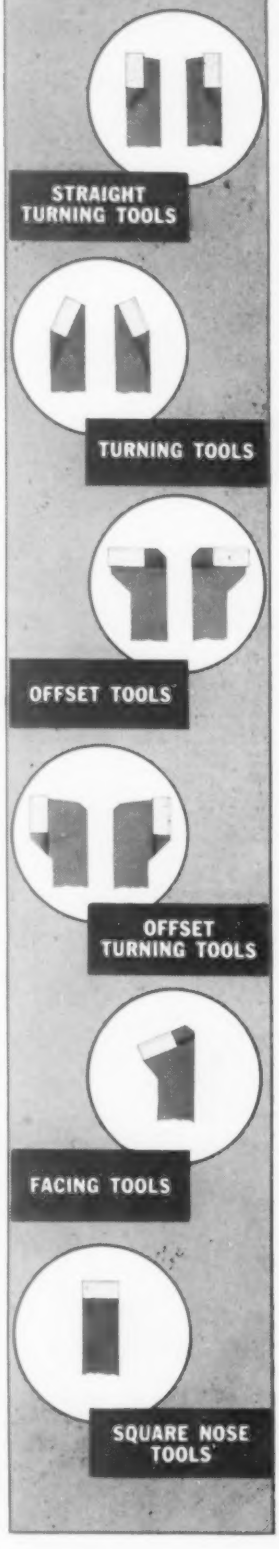

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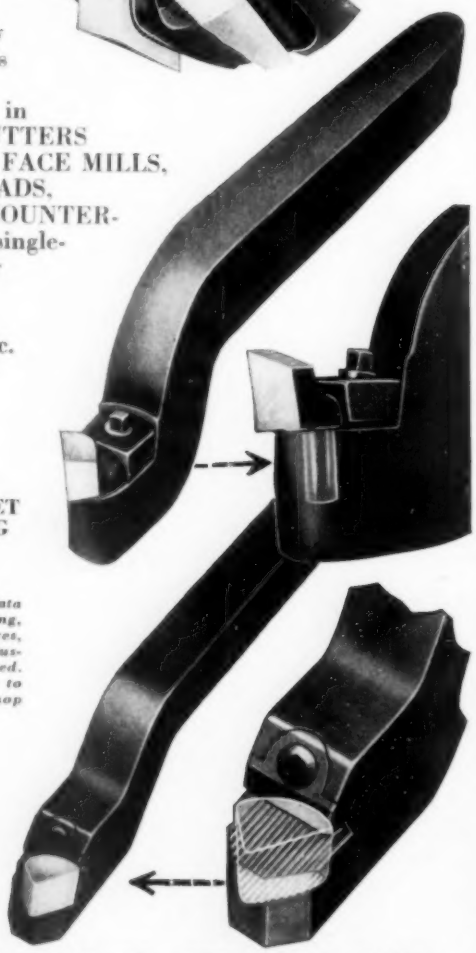

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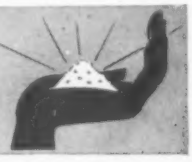

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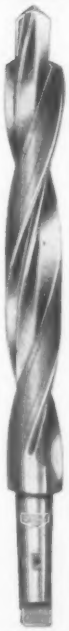

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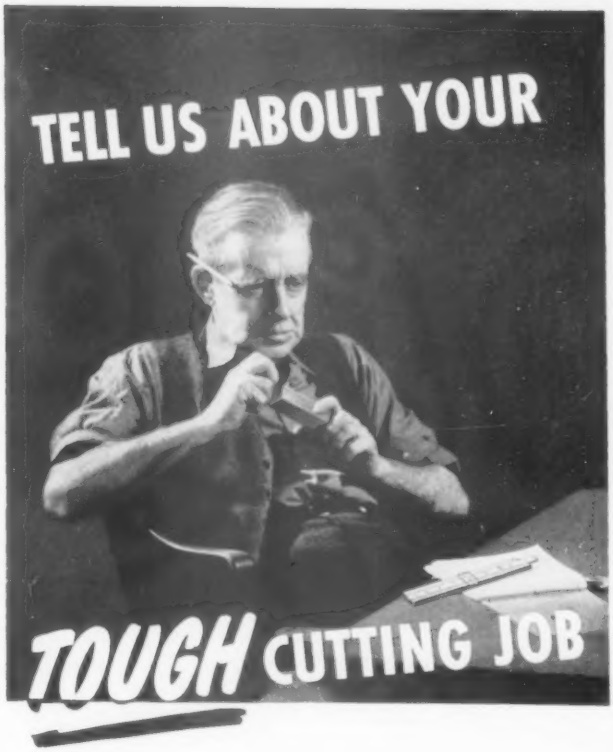

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Instead of our describing the complete range of **CAMPBELL ABRASIVE CUTTING MACHINES**, we would rather have you tell us your specific problem. If it is difficult, perhaps we can simplify it. If it is simple, we may help you to speed up and economize production.

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Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information as a basis, **CAMPBELL** engineers can recommend production procedure and work up cost sheets for you.

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Index of Tool Engineer Advertisers

July, 1945

A

Acme Tool Company 100
Agency—Diener & Dorskind, Inc.

Advanced Tool & Design Co. 124

American Chain and Cable Co.
Andrew C. Campbell Division 125
Agency—Reincke-Ellis-Youngreen & Finn, Inc.

American Tool Engineering Co. 11

B. C. Ames Co. 114
Agency—Badger & Browning, Inc.

Anker-Holt Manufacturing Co. 103
Agency—Van Auken & Ragland

Aro Equipment Corp. 101
Agency—Beeson-Faller-Reichert, Inc.

B

Baker Brothers, Inc. 15

Bay State Abrasive Products Co. 63
Agency—James Thomas Chirurg Co.

Bethlehem Steel Company, Inc. 4

Edward Blake Company 102
Agency—Henry A. Loudon Advertising Agency

C

Carborundum Company 58
Agency—Batten, Barton, Durstine & Osborn, Inc.

Chandler Tool Company 108

Chicago Wheel & Manufacturing Co. .. 53
Agency—Weston-Barnett, Inc.

Columbia Tool Steel Co. 89
Agency—R. J. Skala Co.

Continental Tool Works
Division of Ex-Cell-O Corp. 127
Agency—Holden, Clifford, Flint, Inc.

Covel Manufacturing Co. 12
Agency—Paxson Advertising

D

Dalzen Tool & Manufacturing Co. ... 57
Agency—Holden, Clifford, Flint, Inc.

Danly Machine Specialties, Inc. 120
Agency—Behel and Waldie and Briggs

Darwin & Milner, Inc. 123
Agency—Brad-Wright-Smith, Inc.

Defiance Machine Works, Inc. 61
Agency—Beeson-Faller-Reichert, Inc.

Detroit Broach Company 109
Agency—Chas. M. Gray & Associates

Detroit Reamer & Tool Company 125
Agency—Rolfe C. Spinning, Inc.

Detroit Tap & Tool Company 116
Agency—Denham & Company

E

Eastern Cutter Corporation 113
Agency—Acme Art Service

Economy Tool & Machine Company .. 108

F

Federal Products, Inc. 2

Firth-Sterling Steel Company 107
Agency—Ketchum-MacLeod & Grove, Inc.

G

Gairing Tool Company 85
Agency—R. Marshall Advertising

The Gammons-Hoaglund Company ... 60

General Electric Company 106
Agency—G. M. Basford Company

Giern & Anholt Tool Co. 125

Gisholt Machine Company 119
Agency—The Buchen Co.

J. C. Glenzer Company 120
Agency—R. Marshall Advertising

George Gorton Machine Company 121
Agency—Cramer-Krasselt Co.

Greenfield Tap & Die Corp. 9
Agency—Channing L. Bete Co.

Grob Brothers 62

H

Hammond Machinery Builders, Inc. ..106
Agency—Crescent Advertising Service

Hannifin Manufacturing Co. 53
Agency—Edwin H. Verral

Hardinge Brothers, Inc. 1
Agency—Taylor Ward, Inc.

Herman Stone Company 115
Agency—Hugo Wagensail & Associates

Holo-Krome Screw Corp. 128
Agency—R. H. Young & Associates

I

International Nickel Co., Inc. 52
Agency—Marschalk & Pratt Co.

K

Kennametal, Inc. 123
Agency—W. S. Hill Co., Inc.

Koebel Diamond Tool Co. 125
Holden, Clifford, Flint, Inc.

L

Landis Machine Company 10
Agency—Langsdale Advertising

R. K. LeBlond Machine Tool Co. ..... **Back Cover**
Agency—Perry Brown, Inc.

NOTE: The R. K. LeBlond Machine Tool Company was unintentionally omitted from the Index of Tool Engineer Advertisers in our June issue. Their advertisement appeared on the back cover of that issue.

M

Majestic Tool & Manufacturing Co. ..122

Master Electric Company
Industrial Equipment Division 124
Agency—Kircher, Lytle, Helton & Collett

Michigan Tool Company 14
Agency—Denham & Company

Micromatic Hone Corporation 81
Agency—Witte & Burden

A. Milne & Company 54
Agency—Horton-Noyes Co.

Monarch Machine Tool Company 56
Agency—Fuller & Smith & Ross, Inc.

N

National Acme Company 87
Agency—Fuller & Smith & Ross, Inc.

National Automatic Tool Co. .....6 & 7
Agency—Parker Advertising Co., Inc.

National Broach & Machine Co. 49
Agency—Witte & Burden

National Tool Salvage Company 112

National Twist Drill & Tool Co. 64
Holden, Clifford, Flint, Inc.

Norton Company 13

O

O. K. Tool Company 124
Agency—Claude Schaffner Advertising Agency

Ohio Units 122
Agency—Ankeney Advertising Agency

The Oilgear Company 91
Agency—Kirkgasser-Drew

Ott Machinery Sales, Inc. 124

P

Perfection Tool & Metal Heat Treating 90
Agency—Brandt Advertising Co.

Pioneer Engineering & Manufacturing Co. 112
Agency—St. Claire Advertising Agency

Pipe Machinery Company 105
Agency—Fuller & Smith & Ross, Inc.

Plan-O-Mill Corporation 92
Agency—Holden, Clifford, Flint, Inc.

Pratt & Whitney ..... **Inside Front Cover**
Agency—Wm. B. Remington, Inc.

R

The Ready Tool Company 112

Rockford Magnetic Products Co. 102

S

Sheffield Corporation ... **Inside Back Cover**

Standard Gage Co., Inc. 5
Agency—Hevenor Advertising Agency, Inc.

Standard Machinery Co. 98
Agency—Hammond Goff Company

Stokerunit Corporation 50

Strong, Carlisle & Hammond Co. 114
Agency—Fuller & Smith & Ross, Inc.

D. A. Stuart Oil Co., Ltd. 108
Agency—Russell T. Gray, Inc.

Super Tool Company 16
Agency—Wolfe, Tickling, Dow & Conkey, Inc.

Swartz Tool Products Company 122

Swedish Gage Co. of America 123
Agency—Rolfe C. Spinning, Inc.

U

U. S. Broach Company 111
Agency—Marvin Hahn Advertising

U. S. Tool Company, Inc. 86

Universal Engineering Company 88
Agency—Seeman & Peters, Inc.

Universal Tool Company 106
Agency—Paul R. Jordan

V

The Van Keuren Company 51

Van Norman Company 8
Agency—Sutherland-Abbott Advertising Agency

Vascoloy-Ramet Corporation 97
Agency—Paul Grant, Advertising

Vickers, Inc. 83
Agency—Witte & Burden

W

Wetmore Reamer Company 59

Wood & Spencer Company 100
Scheel Advertising Agency

N. A. Woodworth Company 99
Agency—Brooke, Smith, French & Dorrance, Inc.

Wm. Wrigley, Jr. Company 98
Agency—Ruthrauff & Ryan, Inc.

Z

W. M. Ziegler Tool Co. 102
Agency—Rolfe C. Spinning, Inc.

Ground Multiple

THREAD MILLING CUTTERS

by Continental

A Shell-type cutter with margin on each end
B Modified Acme thread form cutter
C Thread cutter button for Hall Planetary machine
D Shank-type cutter
E Shank-type two-diameter cutter
F Small diameter shank-type cutter with adapter
G Shank-type cutter

for fast, accurate production

Over 20 years' experience in precision thread grinding is built into CTW ground thread milling cutters . . . CTW ground thread milling cutters maintain dimensional accuracy on long production runs throughout the entire life of the cutter . . . Available in both shank and shell type, in National, Whitworth, Acme, V and special forms of thread. Many popular sizes carried in stock . . . For high production thread milling at lower tool cost, use Continental (CTW) ground thread milling cutters. Write to Continental today.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

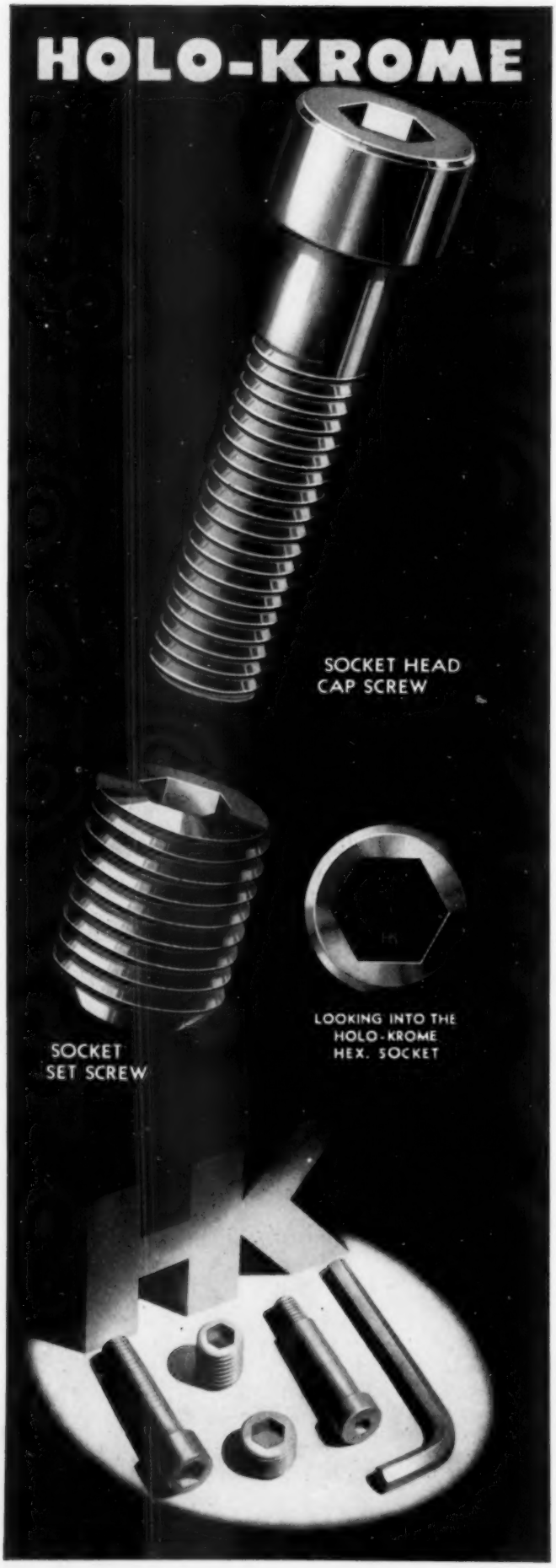
DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental
CUTTING TOOLS

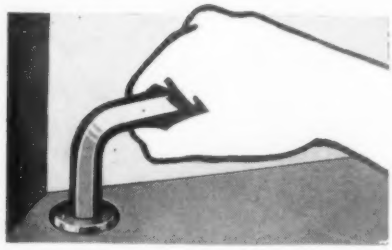
- Boring Bars and Tools
- Broaches
  Broach Pullers
  Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45 40



SOCKET SCREWS

by HOLO-KROME *The BETTER Fastening Method*



INTERNAL WRENCHING QUICK AND POSITIVE

War-time applications—the most severe of proving grounds—prove the many advantages and the unfailing performance of Holo-Krome FIBRO FORGED Socket Screws—the Completely Cold Forged Screws . . . For the better fastening method specify "HOLO-KROME".

HOLO-KROME
fibro forged **SOCKET SCREWS**

Manufactured Exclusively by
THE HOLO-KROME SCREW CORP.
HARTFORD 10, CONNECTICUT, U. S. A.

HOW ARE SUBSTANTIAL SAVINGS ACHIEVED BY GRINDING WITH A CRUSH DRESSED WHEEL?

IS GRINDING TIME REDUCED?

Yes! On the Sheffield Precision Thread and Form Grinder with a crush dressed multi-ribbed wheel, grinding time is often reduced as much as two-thirds.

DOES CRUSH DRESSING PROVIDE A BETTER CUTTING SURFACE?

Yes! Crush dressing removes whole grains from the wheel leaving a multitude of effective cutting edges whereas diamond dressing cuts across the grains leaving flats which do not cut but do increase generation of heat.

IS CRUSHED WHEEL DRESSING FAST?

A full form can be crushed into a wheel on the Sheffield Precision Thread and Form Grinder by the special crushing device, in a fraction of the time required by conventional dressing methods. Intricate profiles requiring hours by diamond dressing, can be crushed into a wheel in a few minutes. After the original crushing of a wheel, recrushings or redressings take only a few seconds.

DOES CRUSH DRESSING REDUCE DRESSING TOOL COSTS?

The Sheffield Corporation introduced and pioneered crush dressing in this country and found from several years' experience that wheel dressing costs by this method on many jobs are considerably less than for diamond dressing. Many dressings are possible with the crusher roll—and a large quantity of parts can be produced from one wheel dressing.

CAN CRUSH DRESSING BE USED ON A SURFACE GRINDER?

Fixtures used in mounting crusher rolls on standard surface grinders for crushing wheels to produce flat profiled work, have been developed and pioneered by the Sheffield Corporation. Sheffield engineered surface grinders incorporating crush dressing equipment as an integral part are available.

WHERE CAN CRUSHER ROLLS BE OBTAINED?

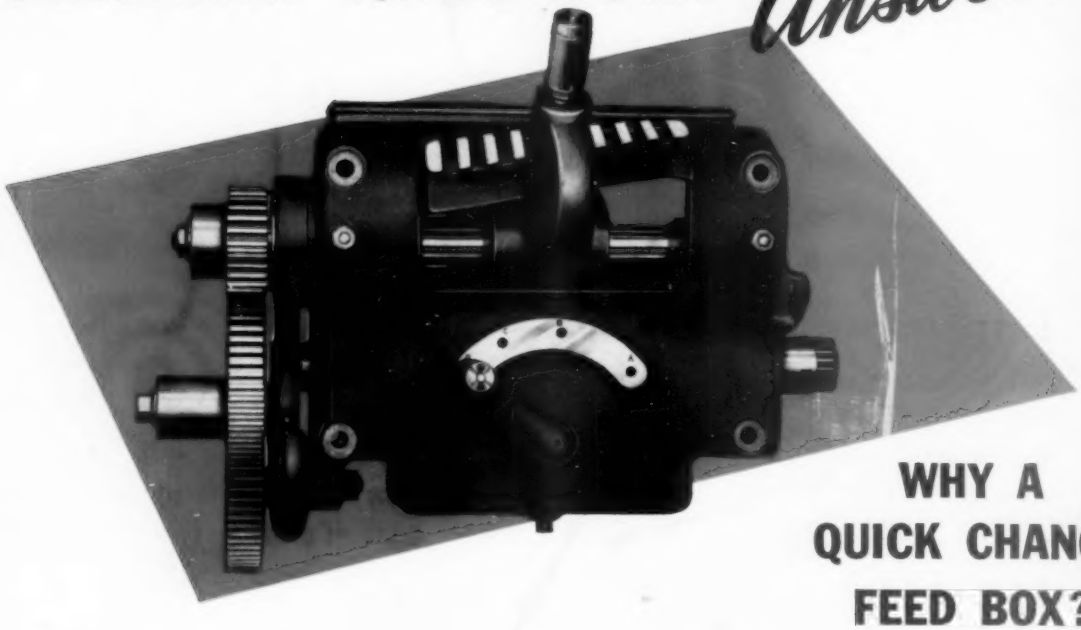
Stocks of crusher rolls for producing threads in standard pitches are maintained in stock for immediate delivery. Rolls for coarser pitch threads and for all other types of forms can be obtained from Sheffield.

WHERE CAN FULL INFORMATION BE OBTAINED?

Details on crusher rolls for immediate delivery, surface grinder crusher roll mountings, the Precision Thread and Form Grinder for producing circular formed and threaded parts and the Micro-Form Grinder for producing crusher rolls and other profiles will gladly be sent by the Sheffield Corporation, Dayton 1, Ohio, U. S. A.

Advertisement by the Sheffield Corporation

TURNING QUESTIONS *Answered!*



WHY A QUICK CHANGE FEED BOX?

Because it greatly speeds and simplifies the selection of feeds and thread cutting ratios. When coupled to the splined feed rod, 54 to 63 definite feeds can be transmitted to the longitudinal movement of the carriage, or the cross movement of the tool slide. When coupled to the lead screw, the same number of definite threads can be cut. Two hand-operated handles control the multiplicity of its combinations. This precision made Quick Change Feed Box is another of the many LeBlond features . . . another reason why men of machine tool "know-how" specify LeBlond Lathes.

★

SINCE 1887

the world has been turning to LeBlond for turning equipment.

★

WRITE FOR CATALOG!

AT YOUR SERVICE

LeBlond field engineers are prepared to help you in your development work, particularly along the lines of the difficult, the "out-of-the-ordinary" turning problems. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war—gained over a period of nearly 60 years from thousands of installations all over the world is yours for the asking. Contact our nearest dealer or write Department FE46.

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

★ YOUR BONDS BUY BOMBS ★ BUY A "BLOCK-BUSTER" TODAY!

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722

CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES